PSYCHOLOGICAL BACKGROUNDS OF DRINKING TAP WATER OR DRINKING BOTTLED WATER OR USING TREATMENT DEVICES

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Psychological backgrounds of drinking tap water or drinking bottled water or using treatment devices

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Abstract

Water is an everyday's part of our life. It is substantial to our nutrition, cleaning or recreation. Yet, water goes generally unrecognised – we only realise its importance if there is something wrong with it. This implicit ubiquity is remarkable, not only because of the omnipresence of water for each person, but also because water is a product, which is sold on a market and purchased by the customer like every other product.

While constant research has explored technological, physical, biological or societal aspects of water (besides others), the scientific focus on the consumer's side is about to emerge (Braden et al., 2009). In settings with unsafe drinking water for example, social scientists drive campaigns aiming at the user's application of treatment methods and devices to fight potential health threats. Such unsafe drinking-water settings can typically be found in developing parts of the world. But even in these parts, the population is not entirely composed of poor. However, information about the wealthy residents can rarely be found, but it can help to understand the present state of affairs as a basis for intervention actions more thoroughly. Yet, the consumer's choice is also a crucial part of the water cycle in settings where no such potential health threats exist. If the end-user is already provided with high-quality tap water, treating the water or consuming bottled water as an alternative appears redundant and peculiar.

In both cases, relying on technological aspects of the consumption and neglecting the consumer's psychology reveals only half of the truth. No technology implements automatically, instead, it has been shown that psychological factors provide good utility to change consumption behaviour.

The present thesis tries to cover both subject areas. First, with interviewing socio-economically diverse residents of Nairobi, Kenya, on water provision, consumption, and treatment aspects, an unconstrained insight into the user motives and actions is targeted. Various psychological factors extracted from well-established psychological theories are linked to the user behaviour concerning the application of various treatment devices and consumption decisions using regression analyses. The

results suggest that there is already good treatment practices among the participants in the study, but that there is also potential for enhancement. This enhancement could best be achieved with devices that deliver a good benefit while requiring little effort. Second, questionnaire research was conducted among Swiss residents, as Switzerland is known as a country with very high-quality tap water, and treating water or buying bottles can generally not be justified with concerns about health threats. Regression analyses suggest that consumers apply treatments because of satisfaction concerns regarding tap water or bottled water. A similar picture can be found for the consumption choice between tap water and bottled water, but here the most prominent factor for the preference of bottled water is the importance of carbonate for the consumer.

Together with more detailed results and explorative data, the present thesis compiles a solid basis of aspects of water consumption under various conditions. It contributes to a better understanding of the consumption motives and emphasises the importance of the links between the consumer's choice and psychological factors of influence. This understanding can be helpful when it comes to planning future water supply or better treatment development and provision.

Zusammenfassung

Wasser ist ein alltäglicher Teil unseres Lebens. Es ist zentral für unsere Ernährung, Reinigung oder Erholung. Trotzdem wird Wasser kaum wahrgenommen – wir bemerken es erst dann, wenn etwas damit nicht stimmt. Diese selbstverständliche Allgegenwart ist bemerkenswert, nicht nur aufgrund der Omnipräsenz von Wasser für jede Person, sondern auch weil Wasser ein Produkt ist, das auf einem Markt verkauft und von Kunden gekauft wird wie jedes andere Produkt auch.

Während sich die Forschung kontinuierlich mit technologischen, physikalischen, biologischen oder gesellschaftlichen (neben weiteren) Aspekten des Wasser beschäftigt, hat sich eine wissenschaftliche Fokussierung der Konsumentenseite erst in jüngerer Zeit entwickelt (Braden et al., 2009). Sozialwissenschaftler führen beispielsweise Interventionskampagnen in Gebieten mit unsicherem Trinkwasser durch, die auf die Anwendung von Behandlungsmethoden und -geräten durch den Benutzer abzielen, um Gesundheitsbedrohungen zu vermeiden. Solche Gegebenheiten mit unsicherem Trinkwasser finden sich typischer Weise in den sich entwickelnden Teilen der Welt. Allerdings setzt sich auch in solchen Gebieten die Bevölkerung nicht ausschliesslich aus Armen zusammen. Erkenntnisse über die wohlhabenden Bewohner lassen sich hingegen nur selten finden, auch wenn diese Informationen hilfreich sind, wenn man den derzeitigen Stand der Dinge als Basis für zukünftige Interventionen tiefgreifender verstehen möchte. Doch auch in Gebieten, in denen keine Gesundheitsbedrohung aus unsauberem Trinkwasser existiert, ist die Wahlentscheidung des Konsumenten ein wesentlicher Teil des Wasserkreislaufes. Da wo der Endverbraucher bereits mit hochwertigem Leitungswasser beliefert wird, erscheint die Wasserbehandlung oder die Wahl von Flaschenwasser merkwürdig und überflüssig.

In beiden Situationen wird nur die halbe Wahrheit aufgedeckt, wenn man sich ausschliesslich auf technologische Aspekte des Konsums konzentriert und die Psychologie des Verbrauchers vernachlässigt. Keine Technologie implementiert sich von selbst, vielmehr konnte die Nützlichkeit von psychologischen Faktoren zur Verhaltensänderung bereits gezeigt werden.

Die vorliegende Arbeit versucht, diese beiden Themenbereiche abzudecken. Mit

den Interviews unter Einwohnern mit ganz unterschiedlichen sozio-ökonomischen Hintergründen aus Nairobi (Kenia) wird zunächst ein unbeschränkter Einblick in die Wasserversorgung, den Wasserkonsum und Aspekte der Wasserbehandlung und damit zusammenhängende Motive und Handlungen der Benutzer angestrebt. Verschiedene psychologische Faktoren, die gut geprüften psychologischen Theorien entstammen, werden mithilfe von Regressionsanalysen mit dem Konsumverhalten und der Anwendung von verschiedenen Behandlungsgeräten in Beziehung gesetzt. Die Resultate weisen darauf hin, dass die Studienteilnehmer bereits über gute Behandlungspraktiken verfügen, dass gleichzeitig aber auch Verbesserungspotenzial vorhanden ist. Diese Verbesserungen können am besten mit solchen Geräten erreicht werden, die guten Ertrag bei geringem Aufwand erzielen. Eine weitere Fragebogenstudie wurde unter Schweizer Einwohnern durchgeführt, da die Schweiz als ein Land mit qualitativ sehr hochwertigem Wasser gilt und Wasserbehandlung oder der Kauf von Flaschen normalerweise nicht in Gesundheitsbedenken gründet. Regressionsanalysen zeigen, dass die Benutzung von Behandlungsgeräten vor allem auf eine mangelnde Zufriedenheit der Konsumenten mit Leitungswasser beziehungsweise Flaschenwasser zurückgeführt werden kann. Ein ähnliches Bild kann für die Konsumentscheidung zwischen Leitungswasser und Flaschenwasser gefunden werden, wobei hier die Wichtigkeit von Kohlensäure für die Wahl von Flaschenwasser entscheidend ist.

Zusammen mit weiteren detaillierten und explorativen Daten bündelt die vorliegende Arbeit eine solide Basis von Aspekten des Wasserkonsums unter verschiedenen Bedingungen. Die Arbeit trägt damit zu einem besseren Verständnis von Konsummotiven bei und unterstreicht die Wichtigkeit von Zusammenhängen zwischen der Verbraucherwahl und psychologischen Einflussfaktoren. Dieses Verständnis kann für die Planung sowohl im Bereich der zukünftigen Wasserversorgung als auch für die Entwicklung und Verbreitung besserer Behandlungsmethoden wichtig sein.

1. Introduction

Water is ubiquitous in everyday life. We tap it, we drink from fountains, we use it for washing and cooking, or for cleaning the car and sprinkling the lawn. Yet, mostly we only realise water as an essential substance if there is something wrong with it. As long as tap pressure, quality, purity, appearance or odour, et cetera are as expected, water is generally taken for granted. Just for these reasons water is an interesting subject of research, because it covers two aspects of life: First, it is an essential part of nurture (and it is generally non-optional to not drink water); second, it is indeed a product with a market where it is sold and purchased.

The first aspect is under constant study. EAWAG for instance, the Swiss Federal Institute of Aquatic Science and Technology (http://www.eawag.ch), is an institution hosting a variety of scientific disciplines each dedicated to water research. Engineers, biologists and chemists (besides others) investigate contaminants, water cleaning technologies, water disinfection, and water provision. Scientists of politics address ways of governmental regulations, water distribution and pricing policies, and so forth. Environmental psychologists conduct research on aspects of user behaviour and motives such as adoption, especially in developing countries where new technologies are just arriving.

Yet, in the broad range of science, the recognition of the second aspect is about to emerge. Generally, scientists start to think about consumption issues, not only limited to developing countries but also in wealthy economies such as the UK, Australia, the U.S.A., Germany, or Switzerland (e.g., Chiarenzelli & Pominville, 2008; A. Jones et al., 2007; Westrell, Andersson & Stenström, 2006). Water turnover is no longer seen as an exclusive direct result of applied technologies, rather, the user, the consumer, is recognised as a crucial part of the water circle, and social scientific understanding of the users' side gains importance (e.g., Braden et al., 2009). Contemporary science has acknowledged the important role of human actors concerning aspects such as sustainability, convenience, or consumption decisions (e.g., Shove, 2003; Southerton, Chappells & Van Vliet, 2004).

One interesting aspect of these consumption decisions encompasses the cus-

tomer's choice between water types and the application of in-house treatment of publicly provided water. Contaminated drinking water is a serious health threat (Balbus & Lang, 2001; E. Mintz, Bartram, Lochery & Wegelin, 2001). Typically, in developing parts of the world, we can find settings where publicly supplied water is considered unsafe. Here, drinking directly from tap or pipe is usually a bad idea, and users are expected to prefer consuming bottled water or treat their tap water with treatment devices before consumption. Much of the available literature on this topic explicitly covers developing countries, however, even in developing countries the population is not entirely composed of poor residents. Therefore, an unconstrained insight into user behaviours regardless of being poor or rich would enhance the picture of the current state of affairs – before planning to change things. The present thesis illustrates such a case by taking the example of socio-economically and supply-qualitatively diverse consumption situations in Nairobi, Kenya.

Yet, while the preference of bottled water over tap water, or the decision to apply treatment to tap water before consumption appears somewhat reasonable in settings with potential health threats due to bad water quality, it is a non-trivial behaviour in environments where such a potential threat does not exist. In Switzerland for instance, tap water is usually considered to be of excellent quality and quantity (e.g., SVGW, 2006). Not only private in-house taps, but also public fountains supply drinkable water, if not otherwise labelled. In light of these facts, treating an already high-quality ready-to-use product or choosing the alternative of buying bottled water appears peculiar. However, newspaper and media reports suggest that the Swiss in fact apply treatment devices (e.g., Fassbind, 2010), and Europe's bottled water industry continues as "one of the great success stories of the design industry" (Crook, Whitfield & Jackson, 2009). However, besides design other explanation approaches exists (e.g., Aitken, McMahon, Wearing & Finlayson, 1994; Corral-Verdugo, Frias-Armenta, Perez-Urias, Orduna-Cabrera & Espinoza-Gallego, 2002; Doria, 2006; Dupont, Adamowicz & Krupnick, 2009; Foltz, 1999; Levallois, Grondin & Gingras, 1998; Levallois, Grondin & Gingras, 1999; McGuire, 1995; Sowdagur, 2006). The contribution of this thesis is to shed a similar light on explanation patterns among the German speaking Swiss.

This thesis encompasses three chapters, the choice of tap water over bottled water in Switzerland, the application of treatment devices in Switzerland, and water consumption and the use of treatment devices in Nairobi, Kenya.[1] In the first of

[1]Note that chapters 2 and 4 are draft versions of articles for publication in journals. To the date of

Figure 1.1.: In Switzerland, water, if not otherwise labelled, is generally considered to be drinking water and can be drunk promptly. The picture shows a tourist in Zurich, Switzerland, drinking from a public fountain. (Source: personal photography.)

these chapters (chapter 2), I present survey research on various psychological motives that drive persons to drink either tap water or bottled water in two typical settings, at home or at work. As mentioned above, especially in Switzerland, drinking bottled water instead of tap water is a peculiar behaviour. Tap water there is considered one of the best worldwide. Yet, business data testifies increasing market sales on the bottled water sector. Indeed, one must notice that tap water suppliers do not compete with bottled water companies. But an increase in bottled water sales would produce litter (through plastic bottles), waste fuel, and cause pollution (through transporting). It is therefore of high interest, whether a need for action is indicated.

The next chapter (chapter 3) picks up a second aspect that can be observed among Swiss consumers, that is, the application of treatment devices. The arguments there go into the same direction: treating (in terms of enhancing) an already perfect product appears to be redundant. However, companies such as Grander do good business. Currently, the users' motives behind the decision to treat something, which does not need treatment, is a black spot. The present work tries to contribute to the illumination of some of the aspects behind this decision.

finishing this thesis, the references were not available. Therefore, the text in the journal articles may differ from the ones presented here.

Where motives to apply treatments are somewhat curious among Swiss consumers, they may stand out clearly in Nairobi, Kenya, where high-quality tap water is a scarcity. Trivially, one would expect that health concerns are key factors for the application of a treatment device. Yet, much of the available argument is based upon research in low-income areas. Chapter 4 presents a more general approach. It tries to detect consumption patterns among users with a diverse socio-economical background. I will describe current treatment practices, find psychological factors that contribute to these practices, and identify fields where further action appears to be necessary.

Finally, a last chapter will summarise some important results from the research conducted throughout this thesis. It also points to some possible future directions of research and action that can be based upon the findings presented here.

In each of these chapters, the goal was twofold. First, an emphasis lay on the exploration and description of usage and consumption patterns concerning tap water, bottled water, and treatment devices. Rather than reliance on media reports, a systematic empirical data basis should be compiled. Second, psychological factors were employed to explore the link between these psychological factors and the resulting consumption behaviour. Although my approach did not aim at causal interpretation, I suspected the psychological factors to contribute to differences in the consumption patterns, and thereby help to understand their structure. These sets of psychological factors were derived from three popular theories, the Protection Motivation Theory (PMT, Rogers & Prentice-Dunn, 1997), the Health Action Process Approach (HAPA, Schwarzer, 2008), and the Theory of Planned Behavior (TPB, Ajzen, 1991; see also section 4.1.1).

The first two theories target health concerns, which include considerations of vulnerability. Items from the factor group of vulnerability express the persons' belief of the risk of a potential threat. Such a threat certainly results from apprehensions about unsafe drinking water and its consequences, that is, illnesses. Other factor groups are also incorporated into these two theoretical concepts; however, in the thesis presented here more groups were derived from the latter theory, the Theory of Planned Behavior (TPB).

The Theory of Planned Behavior proposes a behavioural outcome to be based upon an interplay of normative beliefs, control beliefs, and attitudinal beliefs, all three resulting in an intention towards a desired behaviour. Outer restrictions arise from the actual control that the actor has of, for example, resources (see also figure

1.2 for a brief overview).

The propositions of the TPB have been successfully adopted, for instance to explain the use of the SODIS water-treatment technology (Altherr, Mosler, Tobias & Butera, 2008), acceptance of NoMIX water-toilet systems (Lienert & Larsen, 2006), or the use of arsenic-safe deep tupewells in Bangladesh (Mosler, Blöchliger & Inauen, 2010). In general, the results of these empirical studies testify a good utility of the framework's assumptions. However, I want to emphasise that the TPB has explicit and restrictive definitions of what items are encompassed by the factors. Because my attempt was not theory testing but exploration, I did not apply the theory's conceptions literally. Instead, with taking the factor sets of the TPB to serve for finding and grouping assumptions and response items of interest, my approach appeared more appropriate and more advantageous for the detective work to be accomplished.

Several specific factor groups were taken into account. The factor group of instrumental beliefs summarises items about the utility of a particular behaviour and its costs. Usually they are expressed in commentaries such as "doing A is a good thing" or "having B is important". Psychological factors that fall under the group of descriptive norms display the person's perception of "usually performed" behaviour, that is, one may observe the majority of persons doing something generally with no or few exceptions. Factors among the group of injunctive norms instead display the person's subjective perception of whether a particular behaviour is approved or disapproved among community members. Such considerations are usually expressed in sentences such as "behaviour A is not to be shown", e.g., moral restrictions among a society. Factors from the group of personal norms express what persons consider right for themselves regardless of the formerly described two norms. As an example, these factors may include items expressing personal responsibility for something or, likewise, conscious deviation from a societal established norm. Yet, all types of norms can be sustained, amplified, or forgotten depending on the frequency of communication. Therefore, frequency of communication forms a separate factor group, usually holding items of numbers and/or of times where some sort of a reminder was salient. Items in the factor group of response efficacy display the individually perceived likelihood that the behaviour under consideration will produce an expected outcome. It must be noted that the factual efficacy of the particular behaviour is irrelevant for the user's belief about its efficacy. Finally, the factor group of controllability encompasses items expressing the power of a person to actively and

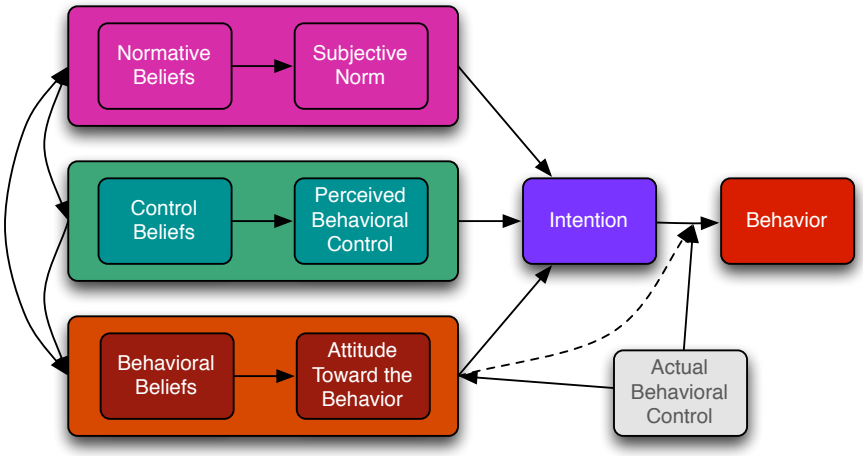

Figure 1.2.: The Theory of Planned Behavior (Ajzen, 1991, schematic). A behavioural belief is the subjective probability that the behaviour will produce a given outcome. Attitude towards the behaviour is the degree to which performance of the behaviour is positively or negatively valued. Normative beliefs refer to the perceived behavioural expectations of such important referent individuals or groups as the person's spouse, family, friends, and – depending on the population and behaviour studied – teacher, doctor, supervisor, and coworkers. Subjective norm is the perceived social pressure to engage or not to engage in a behaviour. Control beliefs have to do with the perceived presence of factors that may facilitate or impede performance of a behaviour. Perceived behavioural control refers to people's perceptions of their ability to perform a given behaviour. Intention is an indication of a person's readiness to perform a given behaviour, and it is considered to be the immediate antecedent of behaviour. Actual behavioural control refers to the extent to which a person has the skills, resources, and other prerequisites needed to perform a given behaviour. Behaviour is the manifest, observable response in a given situation with respect to a given target. (Source: http://people.umass.edu/aizen/tpb.diag.html, text excerpt by this thesis' author.)

intentionally influence an outcome.

In addition to the factorial framework presented so far, another specific factor set was employed repeatedly in this thesis, that is, the factor set of emotional components. Historically, such emotional components can be seen as inner (or cognitive) contradictions. They describe cognitive evaluations of a particular behaviour or observation. The behaviour or observation can point towards the person's plans or against them. The discrepancy is realised, and as a result emotional reactions are experienced, which in turn motivate to maintain or change the behaviour, to maintain or change the personal evaluation of the situation, or to seek this situation or leave it, eventually.

Cognitive dissonance (Festinger, 1957; Harmon-Jones & Mills, 1999), for example, is an emotional state of inconsistency when a person realises a discontentment between what he or she does and – in contrast – actually should do. To reduce the discrepancy, persons may change their evaluation of their own behaviour or the behavioural norm, or change their actual behaviour. By means of evoking the recognition of such a discrepancy, dissonance can be utilised to change human behaviour (e.g., Aitken et al., 1994; Kantola, Syme & Campbell, 1984; Mosler, 2002).

However, studies utilising contradictions were typically conducted in experimental settings where a discrepancy could be evoked intentionally and the results could be observed. Hence, the focus there lay on the *cognitive "computational" process* of contradiction. In contrast, in the studies presented in this thesis, I recorded *the results* of possibly induced discrepancies, that is, the evoked emotional state of inconvenience. It is exactly that what the term "emotional components" refers to.

Besides cognitive dissonance, seven additional emotional components can be identified (Tobias, 2005). Anxiety/worry is realised as a threat to the satisfaction of needs: information about pollutants in the tap water, for example, could cause fear of illnesses. Reactance (Brehm, 1966) is realised as a threat of the freedom of action: Swiss suppliers could withdraw their guarantee of the tap water being drinkable; the user could experience a force to drink bottled water, and consequently even more so want to drink drinkable tap water. Loss of identity is realised as a discrepancy between the status of a person and the behaviour the persons show: cutting centrally supplied high-quality drinking water and leaving it up to the end user to clean water could provoke a loss of experienced status among the users, hence, valuing the common good of "drinkable water everywhere" even higher. Anger/compassion is realised as a threat to the satisfaction of needs of oneself or others: bottled

water consumers may experience a reduction of need satisfaction of others if tap water quality is reduced. Inferiority/jealousy is realised as a decrease in ones own abilities: losses in water quality can perhaps be attributed to one's own low abilities, hence, motivating a person to counteract. Shame (e.g., Gilbert & Andrews, 1998) is realised as a potential threat of one's status: it displays a discrepancy between common behaviour and the person's behaviour. Inequity (Adams, 1963; Adams, 1965; Homans, 1968; Walster, Berscheid & Walster, 1973) is realised as perceived inequitable distribution of resources: it provokes a discrepancy between the expected distribution quota and the actually observed distribution quota.

In sum, the methodological design of the scientific approaches presented here employed survey questionnaires, which encompassed the previously illustrated theoretical material. Demographic and socio-economic information was added as well. The relational structure between the dependent variables (consumption and application variables) and the psychological factors were explored using correlation and regression techniques. These approaches should explain:

1. what products are available in each field of conduct,
2. what consumption patterns exist among consumers in different supply situations,
3. and how psychological factors help to provide differentiated insight into consumption-motive aspects.

This knowledge should principally serve as a safe decision basis for action planners, either in designing future public water supply in Switzerland, or in setting up advertisement campaigns to support consumers' decisions regarding tap water and bottled water, or to provide new strategies of user-side water treatment among residents in Nairobi, Kenya.

2. Psychological factors of tap-water versus bottled-water consumption among the German-speaking Swiss

Preface

This chapter contains a modified draft version of a research article submitted for publication. The article's co-author was Hans-Joachim Mosler[1]. The published text may differ from the text presented here. To the date of writing this thesis, the article's reference was not available.

Abstract

Customers' opinions about drinking tap water or bottled water have been attributed to product features (e.g., contaminants, ingredients), to socio-demographic data (e.g., sex, income), or to health-risk perceptions. Our exploratory research extends the current knowledge about this consumer behaviour, in that it links several psychological variables to the consumption choice. To achieve this goal, a structured questionnaire was mailed to German-speaking Swiss residents in 2008. Regression analyses were then applied to the recorded data of 731 participants to unveil relevant factors. It was shown that socio-demographic data was not linked to the consumption choice, but attitudinal beliefs, ability beliefs, normative beliefs, situational determinants, and emotional components were linked. We discuss reasonable implications and suggest some future steps to extend our basic findings.

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2.1. Introduction

The Swiss are highly concerned about their drinking water. The topic is regularly present in the media, and the contributions usually cover water quality and consumer preference for tap versus bottled water.

Likewise, public water suppliers expend much effort and money in modernising their water-treatment technologies and water supplies. It has been recognised that these investments depend on end-user acceptance. Therefore, public suppliers have shown a growing interest in their customers' opinions about the product delivered. In 2001 and 2006, the Swiss Society of the Gas and Water Branch (SVGW) conducted two surveys on customers' perceptions of tap-water-related topics (SVGW, 2006). The results showed that the public knows generally very little about tap water or bottled water on the one hand, but has high expectations and rigorous opinions about pricing or quality, on the other hand.

A simple product comparison points to an interesting aspect of water consumption: tap water is cheap and available almost everywhere throughout Switzerland, both in private and in public settings (through public fountains, for example). The quality is subject to strong regulations and under constant control. Bottled water, however, costs between 100 and 1,000 times the price of tap water, is not safer or cleaner than tap water (e.g., Lalumandier & Ayers, 2000; Naidenko, Leiba, Sharp & Houlihan, 2008), needs to be bought somewhere off-home, needs room to be stored and cooled, and empty bottles have to be recycled – in general, buying bottled water requires more effort and occupies more resources compared to consuming tap water. Yet, the bottled-water market is a wealthy business, with sales data showing increases year on year (Datamonitor, 2005).

These deliberations lead to the concluding assumption, that drinking bottled water as a substitute for tap water is a behaviour that cannot be explained in terms of "good sense" – but needs to be understood when it comes to future water supply planning (Ferrier, 2001; Doria, 2006; Braden et al., 2009).

Much of the scientific access to drinking-water-related topics has so far focused on biochemical analyses of water (e.g., Lalumandier & Ayers, 2000; Rosenberg, 2003), on organoleptics, that is, odour and taste (e.g., Falahee & MacRae, 1995; McGuire, 1995), on health-risk-related issues (e.g., McGuire, 1995; Jardine, Gibson & Hrudey, 1999; A. Q. Jones et al., 2006; Chiarenzelli & Pominville, 2008; Cicchella et al., 2010), or on general descriptions of consumption data (e.g., Levallois, Guévin

et al., 1998; Westrell et al., 2006; A. Jones et al., 2007; Dupont et al., 2009). However, much of the literature, at best, includes socio-demographics as the social-scientific variables involved. At the same time, psychological research has revealed important information on water-conservation behaviour (e.g., Dickerson, Thibodeau, Aronson & Miller, 1992; Aitken et al., 1994; Trumbo & O'Keefe, 2001; Gregory & Di Leo, 2003; Jackson, 2005). Yet, a deeper exploration of psychological aspects of user opinions, preferences, or decisions, and the link to drinking-consumption behaviour is still under study (Doria, 2006). The present article aims to fill this gap using the example of drinking-water consumption motives among the German-speaking Swiss.

2.2. Theoretical considerations

The purpose of the empirical work presented here was to detect the relation of different psychological factors to water-drinking consumption. However, our interest was not on the total amount of water drunk, rather, we intended to explore the ratio of tap water consumed compared to bottled water. In addition, this ratio may vary in two different situations, at home and at work. A tap could be more easily accessed at home, whereas at work, bottled water is bought routinely at the cafeteria with lunch. Thus, our first research question was how these consumption ratios co-vary across the two situations – at home and at work.

Our second research question pointed to how the situation-specific consumption ratios could be explained by psychological factors. The Theory of Planned Behavior (Ajzen, 1991) offers a framework that links several psychological factors to a resulting behaviour. The framework has been engaged and tested in various water-user-relevant fields, for example, on the use of the Sodis water-treatment technology (Altherr et al., 2008), the acceptance of NoMIX water-toilet systems (Lienert & Larsen, 2006), or the use of arsenic-safe deep tupewells in Bangladesh (Mosler et al., 2010). In general, the results of these empirical studies testify a good utility of the assumptions proposed in the theory. Based on the considerations in the Theory of Planned Behavior, we proposed three different factor groups to be related to various consumption ratios, viz. attitudinal beliefs, ability beliefs, and normative beliefs.

Attitudinal beliefs are expressions of how positively or negatively a behaviour is valued. Persons may value the consumption of bottled water negatively because the price is much higher compared to the price of tap water for the same quality, or they

may value the consumption of bottled water positively if they instead have doubts about the quality and reliability of tap water provided in public through fountains.

Ability beliefs summarise the person's subjective ability to perform the behaviour under analysis. A water consumer may have no particular preference towards one or the other water type, but decides to drink tap water at home simply because it is always available through the in-house tap.

Normative beliefs represent the social pressure to show a specific behaviour. The pressure is determined by the person's beliefs about the expectations of important others, e.g., friends. A tap-water drinker, for example, may believe that her visiting friends expect her to serve bottled water, and therefore she always serves bottled water.

We completed our design with three further factor groups suspected to be relevant for consumption: situational determinants, emotional components, and socio-economical indices. Situational determinants group conditions that may emerge in a particular situation, where one such factor, for instance, the satisfaction with the water type drunk, may be highly relevant for the consumers' decision at work, but absolutely irrelevant at home.

Emotional components result from cognitive processes where the person evaluates a particular situational constellation. The constellation can point towards the person's plans or against them. Due to the result of the evaluation and the subsequent emotional reaction, people maintain their behaviour, change it, or change their opinions about the situational constellation and their behaviour to make it more consistent. Authors suggest that there is a fixed individual tendency of persons to react in similar situations consistently (e.g., Dickenberger, 2006). Dissonance (Festinger, 1957; Harmon-Jones & Mills, 1999), for example, is an emotional state of inconsistency when a person realises a discontentment between what he or she does and – in contrast – actually should do for various personal reasons. Bottled-water consumers, for instance, could experience such a state of inconsistency when they are provided with information that buying bottles costs a lot more and harms the environment more compared to tap water. Consequently, either these consumers may change their behaviour or they may re-evaluate the discontent information, for instance, in that it loses personal relevance or is enriched by contradictory information.

It has been repeatedly proposed that socio-economic data (e.g., sex, age, socio-economic class) are important factors that distinguish between one or the other

water-consumption behaviours (e.g., Dupont et al., 2009). In recording this data, we addressed our third research question, that is, whether there is an important link between socio-economics and the consumption ratios.

Our fourth and last research question was whether carbonation of water and habitual aspects are particularly important factors when it comes to the customer's decision. Carbonation is a special feature of bottled water. Though it is also possible to carbonate tap water (through specific devices), it may require more effort for the end user compared to simply buying carbonated water. We therefore assumed that a customer consumes more bottled water, especially if carbonation is an important factor. Likewise, it appears plausible that persons simply consume what they are used to consuming, despite any product feature, information, or deliberate considerations. If this is the case, then habit should be one important consumption factor.

2.3. Methods

A mailed survey was conducted to access the psychological causes discussed above for drinking-water consumption. In November 2008, a structured questionnaire was mailed to 2,844 German-speaking persons in Switzerland. The addresses were selected randomly from the phone book. A cover letter explained the aim of the study and invited the recipients to fill in either the mailed printed or the online version of the questionnaire that was provided with a URL. In addition, a payment was announced with a lottery of 10 shopping vouchers, each valued at 50 Swiss Francs, for a Swiss retail chain. A brief feedback report was offered to interested participants. A post-paid return envelope was included in the mailing. In December 2008, a reminder to fill out the questionnaire was mailed to every initial address in the sample.

By the end of January 2009, a total of 845 questionnaires had been returned (29.7 %): 114 questionnaires were removed from the data set due to inconsistencies or substantial levels of incompleteness, leaving a total of 731 valid cases in the analysis. Most responses were returned from the Cantons of Zurich (174), Berne (123), and Aargau (88), with only a few responses returned from the Cantons of Uri (2), Appenzell (6), and Glarus (3). The ages of the 354 females ranged from 14 to 90 years with a mean of $M = 49.4$ ($SD = 15.3$), the ages of the 373 males ranged from 22 to 90 years with a mean of $M = 54.5$ ($SD = 15.8$). Two females and two

males did not specify their age. Almost half of the respondents lived in rural areas (48.6 %), the other half being equally distributed between suburban (28.7 %) and urban (22.7 %) areas. The household sizes varied largely between 1 and 7 persons, with 20.4 % single households, 43.4 % as households of 2 persons, and another 28.4 % with 3 or 4 persons in the household. Social status and education both showed a normal distribution. 60.5 % of the respondents aligned themselves as middle class. A total of two-thirds reported a high school education (36.9 %) or higher vocational training (29.8 %).

The questionnaire was loosely structured into various sections to give a narrative order to the respondents. The first page showed an introduction and emphasised that participation was voluntary and that responses would be stored and treated anonymously.

Responses to the questionnaire items were recorded on open, numeric, or forced-choice rating scales. Open-response fields and numeric-response fields were designed with a fixed space for entry, provided with dotted lines and units where applicable. A label was assigned to each scale point of a forced-choice rating scale. The most-right label was in accord with the adjective in the question.

As the dependent variable, the consumed amounts of tap water and bottled water were elicited. Participants estimated either consumption in litres on a normal day in either of two situations, at home, or, if applicable, at work.

The group of attitudinal beliefs was approached by asking for the consumption importance of the following aspects: water temperature, taste, healthiness concerns, environmental sustainability, and pureness. Each item was provided with a 4-level rating scale from “not important” to “very important”.

Items that addressed ability beliefs were deployed by asking for the importance of “price”, “convenience”, and “easy availability”, each provided with the same scales explained above. In addition, respondents were asked to rate how cheap/expensive tap water and bottled water are for them. Answers were recorded on two separate 7-level rating scales, ranging from “very expensive” to “very cheap”.

Two variables from the group of normative beliefs were compiled by asking for the importance of “what others think” and “what others do” for either situation with 4-level scales ranging from “not important” to “very important”. Respondents also estimated how many of their friends/colleagues/relatives drunk tap water or bottled water in either of the two situations, at home and at work. The factor block was completed with three additional items, where respondents were asked to

imagine various situations. In situation one, they invited guests, and then rated how obligated they felt to serve them with bottled water. The response was recorded at five levels, ranging from “not obligated at all” to “very obligated”. In situation two, they are guests of friends, and then rated how appropriate this situation would be if they were served bottled water. The scale ranged from “very appropriate” to “very inappropriate” across seven levels. In the last situation of this block, respondents imagined they were in a restaurant, and rated how obligated they would feel to order bottled water. The response scale was identical to that from the first fictive situation.

Situational determinants were addressed by asking the respondents to rate the situational-specific importance of “water contains carbonate” and “trust in the quality”, each on a 4-level rating scale from “not important” to “very important”. Additionally, participants rated their satisfaction with either water type on a 7-level rating scale, ranging from “very unsatisfied” to “very satisfied”. More items from this group asked for the trust in the proper quality, the number of negative experiences, and the knowledge, each concerning either type of water. Answers here were recorded on 5-level rating scales ranging from “no/never” to “very much/very often”.

In both situation-specific blocks, the questionnaire contained an item asking for the importance of habit. Answers to this item were recorded on a 4-level rating scale, ranging from “not important” to “very important”.

Emotional components were derived from three fictive situations. Each fictive situation was written as a very short story stating one or another situation. The respondents were asked to answer the appended questions given that the situation was real.

The first fictive situation explained that the news said that drinking-water quality could no longer be taken for granted in the future and that people would have to improve their drinking quality on their own. It was then asked how strongly the identity of the respondents was violated in that situation, how obligated they would feel to change their behaviour, and how much anxiety they would experience in such a situation, each on a 5-level rating scale from “not at all” to “very strong/very much”.

The second fictive situation induced the information from a study that the price of bottled water is 1,000 times the price of tap water, and that bottled water has a distinctly more negative impact on the environment. Respondents should then have revealed how pleasing this information was for them. Here, a 7-level rating scale

was provided, ranging from "very unpleasing" to "very pleasing".

The last fictive situation in this factor group explained that the local municipal water supplier had decided to drop its water quality to the level of industrial water and that it would consequently be up to the consumer to prepare it for drinking quality. Other suppliers, instead, would continue delivering drinking-quality water. Here, the respondents rated how jealous they were of persons that were still supplied with drinking-water quality, how much compassion they felt with others in this negative scenario, and how much anger they felt (on a 5-level rating scale from "no" to "very much" for each of the three variables), and how fair they found this situation (with a 7-level rating scale from "very unfair" to "very fair").

Socio-demographics were recorded with 4 items. Persons noted their "year of birth" (re-coded to age in 2008), and indicated their "sex". Social status was accessed using a 5-point rating scale, ranging from lower class to upper class. For the self-assignment of education, six levels from the International Standard Classification of Education (ISCED) were provided, ranging from "primary school" to "doctorate and higher" (UNESCO, 1997).

For each situation, at home or at work, a consumption ratio was calculated, resulting from the amount of tap water drunk in proportion to the total water drunk (from tap and from bottles) in that situation. These two ratios formed the dependent variables.

First, the two dependent variables were explored for a linear relationship. Next, a regression analysis was calculated, one to derive relevant factors for home consumption, and one to derive relevant factors for work consumption (e.g., Hays, 1994). Each regression analysis started with the initial set of variables and the specific consumption ratio as the dependent variable. Then, outlier cases where removed. A case was considered an outlier if the studentised residual (see Venables & Ripley, 2002) of the linear prediction was more extreme than two standard deviations of the studentised residuals of the model. The remaining model was then assessed for relevant predictors. As a loose rule, a predictor was considered relevant if its estimate was higher than 1 (indicating a potential change of 1 percentage point in the consumption index), and if the significance level was below 0.1. In addition, predictors were continuously checked for collinearity (Fox & Monette, 1992). Irrelevant predictors were removed and the procedure was conducted again, until a model with only relevant predictors was gained.

The final model was then checked again with the set of predictors that were

Table 2.1.: Descriptive statistics of consumption ratios at home and at work. The consumption ratio ranges from 0 to 100 indicating the percentage of tap water drunk compared to the total water drunk from tap and bottles.

	N	M	SD	Med	Skewness	Kurtosis
Consumption ratio home	731	69.24	36.52	90.91	−0.73	1.35
Consumption ratio work	425	56.27	54.23	71.43	−1.76	2.19

excluded during the analysis, as well as the socio-economic variables. Each single variable was re-included in the situation-related final regression model. The resulting changes in the predictor's weight, B, the significance level, p, and the determination coefficient of the resulting model, R^2, were then assessed to decide whether the predictor should be included, or remain excluded from the final model.

All data analysis was performed using $\mathcal{R}$ (R Development Core Team, 2011). The complete questionnaire can be found in appendix A, the variables descriptives are listed in table C.1 in appendix C.

2.4. Results

Table 2.1 shows the descriptive statistics of both consumption ratios. 58.1 % of the respondents gave information about their work consumption. At home, the typical consumer drank about 70 % tap water, where at work the ratio was about 50 : 50. However, both ratios showed a bimodal distribution with peaks on both edges.

Figure 2.4 cross-tabulates the consumption ratios, grouped by bottle-only drinkers, mixed drinkers, and tap-only drinkers. 4.5 % of the respondents were bottle-only drinkers. An additional 5.1 % of the respondents were bottle-only water drinkers at home, but did not provide information about their work consumption. 20.7 % (+18.9 % with no work information) were tap-only drinkers. About half of the respondents were mixed drinkers in one or other situation.

Both consumption ratios showed a medium correlation of $r(423) = .5$, $p < 0.001$ (Cohen, 1988). A linear regression with the home-consumption ratio as the dependent and the work ratio as the predictor revealed a significant estimate of $B = 0.40$, $p < 0.001$ with a determination coefficient of $R^2(423) = .25$.

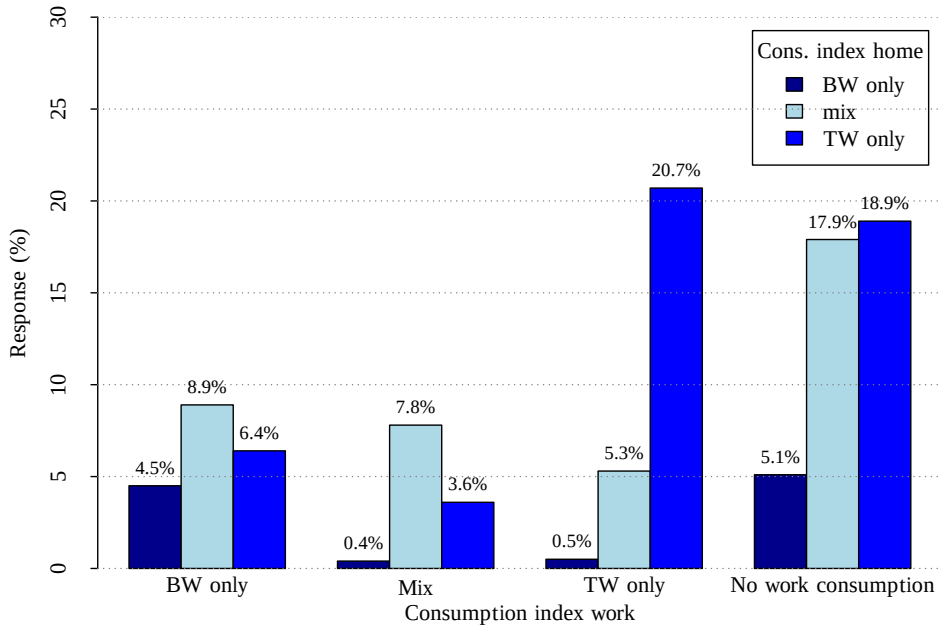

Figure 2.1.: Grouped consumption indices at home per grouped consumption index at work. BW = bottled water, mix = both, bottled and tap water, TW = tap water.

Table 2.2 shows the regression exploring relevant factors with the consumption ratio at home (hereafter "home model"). Thirteen variables remained in the regression (see table 2.3 for descriptive statistics). All variables show relevant estimates and were significant. All variance inflation factors were below the suggested upper bound of VIF = 2 (Field, 2005). The overall model determination coefficient was $R^2(569) = .568$ ($R^2_{adj}(569) = .558$). Fifteen outliers (2.89 % of the cases of the initial model) were removed from the final model.

The most important factor in this regression was the "importance of carbonate". The predictor displayed a large negative regression weight, meaning that the more important carbonate is, the less is the proportion of tap water that is drunk. The variable belongs to the group of "situational determinants". Five more variables in this block revealed a relevant relation to the tap-water ratio. The "satisfaction with tap water", and the "dissatisfaction with bottled water" lead to a higher consumption index. The same results could be found with trust: higher "trust in tap-water quality" and lower "trust in bottled-water quality" resulted in an increasing consumption ratio. The estimates of the two satisfaction items were about 2, where the estimates of both trust-related items were higher than those of the rest in this factor group. Further, "knowledge about bottled water" had a negative relation to the target variable, meaning that the more the respondents knew about bottled water the less they drank tap water at home.

The second important variable for the consumption ratio at home was the "importance of availability". This variable had a high positive estimate, meaning that the more important the availability was, the more a person tended to drink tap water instead of bottled water. One other variable in this factor group of "ability beliefs", the "importance of convenience", also had a positive relation to the target variable.

From the variable block of "normative beliefs", three variables remained in the final regression at home. The "number of friends that drink tap water at home" had a positive relation with the dependent variable, while the "number of friends that drink bottled water at home" displayed a negative relation. Either of the two variables co-varied with the consumption ratio towards the direction of the behaviour asked for: either as more friends drank tap water so did the respondents, or as more friends drank bottled water at home, so did the respondents. As a third variable, the "experienced obligation to serve guests with bottled water" also had a negative relation to the target variable; that is, the more obligated one feels to serve guests

Table 2.2.: Linear regression of factors related to the consumption ratio at home. Empty rows indicate that in this factor group no variable revealed a relation to the consumption ratio at home.

Variable	B	SE	β	p
Constant	67.28	11.68		<.001
Attitudinal beliefs				
Ability beliefs				
Importance of convenience	3.79	1.19	0.11	<.001
Importance of availability	7.27	1.56	0.15	<.001
Normative beliefs				
N friends drink tap water at home	4.43	1.23	0.13	<.001
N friends drink bottled water at home	−4.79	1.31	−0.11	<.001
Experienced obligation to serve guests with bottled water	−4.49	0.96	−0.15	<.001
Situational determinants				
Importance of carbonate	−9.21	1.08	−0.25	<.001
Satisfaction with tap water	2.1	0.7	0.1	<.001
Satisfaction with bottled water	−2.03	0.8	−0.09	.01
Trust in tap-water quality	5.41	1.56	0.12	<.001
Trust in bottled-water quality	−6.06	1.36	−0.14	<.001
Knowledge about bottled water	−4.43	1.31	−0.09	<.001
Emotional components				
Unfairness with unequal drinking-water quality distribution	−2.52	0.81	−0.09	<.001
Adequacy of their own behaviour with information about tap water versus bottled water	3.82	0.56	0.21	<.001

$R^2(569) = .568$, $R^2_{adj}(569) = .558$

Table 2.3.: Descriptive statistics for the factors in the regression analysis on the consumption ratio at home ($N = 583$).

Variable	M	SD	Med	Min	Max	Skewness	Kurtosis
Importance of convenience	2.84	0.99	3	1	4	−0.47	−0.8
Importance of availability	3.33	0.77	3	1	4	−1.06	0.78
Number of friends that drink tap water at home	3.33	0.98	3	1	5	−0.09	−0.9
Number of friends that drink bottled water at home	3.45	0.87	4	1	5	−0.17	−0.58
Experienced obligation to serve guests with bottled water	2.73	1.25	3	1	5	0.04	−1.12
Importance of carbonate	1.89	0.99	2	1	4	0.8	−0.52
Satisfaction with tap water	5.89	1.74	7	1	7	−1.92	2.59
Satisfaction with bottled water	5.52	1.56	6	1	7	−1.48	1.71
Trust in tap-water quality	4.2	0.77	4	1	5	−0.72	0.19
Trust in bottled-water quality	4.12	0.86	4	1	5	−0.75	0.11
Knowledge about bottled water	2.79	0.78	3	1	5	0.34	0.22
Unfairness with unequal drinking-water quality distribution	2.08	1.26	2	1	7	1.74	3.6
Adequacy in their own behaviour with information about tap water versus bottled water	4.07	1.98	4	1	7	0.1	−1.23

with bottled water, the less the ratio of tap water at home. The estimates of all three variables varied between 4 and 5, and compared to the highest and lowest values these variables displayed a medium effect on the consumption ratio at home.

Two variables from the block of "emotional components" were identified to relate with the target variable. First, persons who experienced more "unfairness with unequal drinking-water quality distribution", also drank a larger ratio of tap water. Second, persons that saw more "adequacy in their own behaviour with information about tap water versus bottled water" also drank a larger ratio of tap water. Both estimates were among the smaller influences on the consumption ratio at home.

Neither the socio-economic variables nor variables from the block of "attitudinal beliefs" were found to stay in relevant relation with the consumption ratio.

Some of the factors important in the home model also displayed relevant estimates in the regression for the tap-water consumption ratio at work ("work model"). Table 2.4 shows the regression exploring relevant factors for the work model.

Eleven variables remained in the final regression model (see table 2.5 for descriptive statistics). Three variables were significant at a Type-I error level of $p = .10$ and eight variables were significant at a Type-I error level below $p = .05$. All variables had relevant estimates. All variance inflation factors were below VIF = 1.5, hence below the suggested upper bound of VIF = 2 (Field, 2005). The overall model determination coefficient was $R^2(361) = .486$ ($R^2_{adj}(361) = .471$). Fifteen outliers (4.75 % of the cases in the initial model) were removed from the final model.

High influences could be found for the "number of friends that drink tap water at work" and the "number of friends that drink bottled water at work". Both predictors co-varied with the target variable in the direction asked for: the more "tap-water friends" and the less "bottled-water friends", the higher the tap-water ratio at work. The "adequacy of being served with tap water at friends' places" was the third variable in this block, "normative beliefs". Compared to the other estimates in the work model, this variable showed a medium regression estimate.

As in the home model, "importance of carbonate" was a substantial aspect. The estimate for this variable was the second highest in the equation, and every other variable in the factor group of "situational determinants" showed a much lower estimate. Just as with the "importance of carbonate", the "satisfaction with bottled water", the "negative experiences with the consumption of tap water", and the "knowledge about tap water" had negative relations with the target variable, meaning the more important these issues were, the lower was the tap-water consumption

Table 2.4.: Linear regression of factors related to the consumption ratio at work. Empty rows indicate that in this factor group no variable showed a relation to the consumption ratio at work.

Variable	B	SE	β	p
Constant	54.56	19.51		.01
Attitudinal beliefs				
Importance of temperature	3.84	2.06	0.05	.06
Importance of eco-friendliness	5.99	2.1	0.12	<.001
Ability beliefs				
Normative beliefs				
Number of friends that drink tap water at work	11.88	1.88	0.28	<.001
Number of friends that drink bottled water at work	−7.8	2.11	−0.18	<.001
Adequacy of being served with tap water	−4.81	1.32	−0.17	<.001
Situational determinants				
Importance of carbonate	−10.66	1.85	−0.25	<.001
Satisfaction with bottled water	−2.01	1.15	−0.08	.08
Negative experience with consumption of tap water	−4.82	2.48	−0.07	.05
Knowledge about tap water	−4.4	2.06	−0.09	.03
Emotional components				
Compulsion towards behaviour-change with dropped water quality	4.42	2.23	0.08	.05
Adequacy in own behaviour with information about tap water versus bottled water	2.76	0.92	0.14	<.001

$R^2(361) = .486$, $R^2_{adj}(361) = .471$

Table 2.5.: Drinking water in Switzerland. Descriptive statistics for the factors in the regression analysis on the consumption ratio at work ($N = 373$).

Variable	M	SD	Med	Min	Max	Skewness	Kurtosis
Importance of temperature	2.88	0.87	3	1	4	−0.54	−0.27
Importance of eco-friendliness	3.05	0.88	3	1	4	−0.55	−0.55
Number of friends that drink tap water at work	2.82	1.09	3	1	5	0.23	−0.84
Number of friends that drink bottled water at work	3.62	0.96	4	1	5	−0.48	−0.32
Adequacy of being served with tap water	2.41	1.5	2	1	7	0.97	0.02
Importance of carbonate	1.88	1.04	2	1	4	0.83	−0.63
Satisfaction with bottled water	5.49	1.54	6	1	7	−1.49	1.7
Negative experiences with the consumption of tap water	1.62	0.71	2	1	5	1.15	2.03
Knowledge about tap water	2.88	0.85	3	1	5	0.45	0.06
Compulsion towards behaviour-change with dropped water quality	4.26	0.78	4	1	5	−1.03	1.04
Adequacy in their own behaviour with information about tap water versus bottled water	4.13	2.01	4	1	7	0.04	−1.28

ratio.

From the variable block of "attitudinal beliefs", two factors showed relevant estimates in the regression equation. Both, the "importance of temperature" and the "importance of eco-friendliness" had a positive influence on the tap-water consumption ratio at work, that is, the more important either of the two aspects, the higher the consumption ratio at work.

Two variables from the variable block of "emotional components" revealed relevant relations to the target variable, both with a positive estimate. As in the home model, persons who saw more "adequacy in their own behaviour with information about tap water versus bottled water" also had a higher consumption ratio. Further, people that experienced more "compulsion towards behaviour-change with dropped water quality" also had a higher tap-water consumption ratio.

From the variable block of "ability beliefs", no variable remained in the final regression model.

2.5. Discussion

The recurring central information in the public's opinion is that tap water is very popular and should be the consumption product of choice for various reasons. Our results display the same pattern: almost each second person in our sample was a tap-only drinker in either situation. Nevertheless, one-in-ten persons was a bottle-only drinker at least at home, contrasting with the idea that tap water popularity is on everybody's mind. Moreover, business data suggests a continuous increase in bottled-water sales (Datamonitor, 2005). Our goal was to detect why people choose bottled water where for "good sense" tap water should be the number one product.

Our first research question was how the consumption ratios in the two situations co-vary. In our study, a medium positive relation was found, indicating that to a certain extent, persons show the same consumption behaviour in different consumption situations. Here, the relation applied to two specific situations, at home and at work, but it may generally be assumed that consumption patterns remain relatively stable across more situations.

However, there seemed to be variation in the consumption ratios that could not be explained by merely relating the consumptions to one another. Thus, our second research question asked for psychological factors that explain the situation-specific consumption ratios.

In both consumption situations, we could detect a set of psychological factors related to the consumption ratios. For the home consumption, "importance of carbonate" and "importance of availability" were the most important determinants: the less important carbonate is, and the more important availability is, the higher the tap-water ratio at home is. Furthermore, carbonation was also one important factor for work consumption, and thus is indeed crucial for the consumption of bottled water.

Yet, besides these high-influence factors, we found more variables with remarkable influence. First, when people found themselves in a social environment with persons showing the same behaviour, for both consumer types, the tap-water drinkers as well as the bottled-water drinkers, there was a clear link between what they did and what behaviour they observed in their social group. Interestingly, when directly asked for the importance of what others do or think, no person reported an influence on their own behaviour.

Second, satisfaction and trust were crucial determinants for home consumption, in that trust in and satisfaction with tap water were positively related to the consumption ratio, whereas the relations of trust in and satisfaction with bottled water to the consumption ratio were negative. For work consumption, we found two indicators that point in the same direction: "satisfaction with bottled water" and "negative experiences with the consumption of tap water". Moreover, while increasing importance of convenience and availability led to an increasing consumption ratio at home, for the work consumption the importance of eco-friendliness and temperature were the relevant variables. From these variables, we conclude that, so far, consumption behaviour is based on various psychological factors, but that these factors vary across situations.

Third, several emotional components were related to the consumption ratio, both at home and at work, among them the "experienced adequacy of the consumer's own behaviour with information about tap water versus bottled water". This relation reads that bottled-water drinkers are indeed discontented with their consumption behaviour if they realise that bottled water is much more expensive and has more environmental impact.

What we could not detect was an influence of any of the socio-economic variables included in the design of our study. Neither age nor sex, income, or socio-economic class were variables that remained in the final regression equation, even when we forcedly checked for each single variable at the end of the process. Following this

finding, we conclude that the decision between either water type is not an issue of whether persons are male or female, what income they have, or in which social class they assign themselves – a result that criticises findings in recent literature (e.g., Dupont et al., 2009).

In sum, we confirm the relation across situations, the importance of carbonation, normative influences of others, and the effects of emotional components and situation-specific psychological factors, but we cast doubt on the influence of socio-economics.

So far, our findings emphasise assumptions proposed in current literature that drinking water is a behaviour, which is indeed based on social, psychological, and user-specific aspects (Doria, 2006). Moreover, the variables in our study extend the current frame of organoleptics or health-related ideas on the customer's side. Of course, product features, such as the presence or absence of carbonation, are important aspects for the consumer's choice. Yet, attitudinal beliefs, normative beliefs, and behavioural options were shown to play important roles as well. Furthermore, while much of the literature attributes usage differences to socio-economic variables, we showed that there was no link to the choice between tap water or bottled water.

However, there are limitations to our study that may have influenced our findings to a certain extent. First, the size of the sample does not reach a size required for representativity, viz. 1 per cent of about 6 million German-speaking inhabitants, but we query whether representativity is an important aspect of large distortion. Instead, we think that our sampling procedure could have led to a systematical bias (e.g., Dillman, 2001), in that persons with no phone-book entry could not be sampled and are thus under-represented. These persons are typically young persons in their twenties with high mobility, and in fact, when comparing our age distribution with the Swiss census, we notice a slight lack of participants between 20 and 30 years of age. It could also be assumed that, in principle, we have received more answers from persons who have a higher interest in water-related topics; that is, if persons did not have at least some interest in the topic, they would hardly have responded to the survey.

A second aspect of critical concern is that of causal relations. We used the method of regression analysis as a descriptive tool allowing us to study many variables at one time (Hays, 1994), but we did not intend to point in the direction where one variable is the cause for another. To access causal relations, at least two time points must be recorded, there should be some sort of "treatment", e.g. through a

natural event in that period, and a theory should be used that links the variables with causal relations. Consequently, we only state that the variables co-vary.

By far the highest interest area for further research would lay in these links of causality. A considerable sample size with a more or less constant monitoring on opinions, emotional considerations, consumption amounts on the one hand, and records about drinking-water related events among the public on the other, could give reliable insight into changes in water-user behaviour. In this project, our findings give a reasonable insight into the psychological factors that should be focused on in further studies. It may also be interesting to examine whether these variables have different states and undergo different changes in different cultural spheres, e.g. the French-speaking Romandy and the Italian-speaking Ticino, particularly in Switzerland.

With the information revealed by such an approach, drinking-water planners and tap-water suppliers would eventually have good knowledge at hand to combat the current trend of growing bottled-water use as a substitute for tap water.

2.6. Conclusions

In investigating water-consumption behaviour among the German-speaking Swiss, we particularly looked for the psychological factors involved. This approach should extend and correct ideas where product features, health-related ideas on the customer's side, organoleptics, or socio-demographics are sufficient key factors for the consumption choice. Our study revealed several psychological factors that stand in important relation to the ratio of the two water types consumed. Although the results do not allow for causal deduction, the utility is that the factors unveiled here help to understand various consumption aspects on the users' side and – eventually – will provide a solid foundation as to how their consumption is steered.

3. The use of Point-of-Use-Systems among Swiss consumers

Preface

The present chapter contains an empirical essay on drinking water consumption and the use of treatment devices. For the purpose of simplicity, it only loosely follows the structure of APA-style written content. Some of the material is based upon the research article presented in chapter 2 and therefore refers to discussions in the preceding.

Abstract

Swiss tap water has a very high quality. The water is drinkable, and health concerns should be of no relevancy among customers. However, it can be observed that some apply treatments to their water before drinking. A variety of such treatments are available, e.g., filters such as Brita, – yet, there is also treatment devices, which lack natural-scientific justification. The present essay tries to display the current state of affairs about the use or non-use of treatment devices among German speaking Swiss. The analyses were based upon data collected through a survey on drinking water consumption patterns among German speaking Swiss conducted in 2008. Regression analyses were applied to the recorded data of 731 participants to discover relevant factors. While a general use-non-use regression showed some utility, specific reasons for specific treatments remain unclear.

3.1. Introduction

The Swiss public discussion recognises Switzerland as the "Wasserschloss Europas" (European "castle set on the lake"). Swiss water suppliers apply modern technologies to treat their water, there is an active water research sector, and the product, the tap water, is seen to have a very high quality. In chapter 2, I presented an

analysis of psychological factors that play a role when the consumer decides to drink bottled water or tap water. Yet, substituting tap water with bottles is only one of the consumer's decisions that seeks explanation given the conditions and the water quality in Switzerland. Another interesting phenomenon is the application of treatment devices to tap water before consumption. In line with the arguments presented above, treating an already-perfect-product appears to be redundant, and the justification of the customer's decision to buy and apply a treatment is not obvious. The goal of this chapter is to shed some light on the links between a variety of reasons, drinking water consumption patterns, and the application of treatments.

A treatment can be seen as a device or method that is applied to water in order to enhance the water's quality. A wide range of such treatment devices is available to the consumer in Switzerland. However, I distinguish between two different classes of such treatments, "hard treatments" and "soft treatments". The term "hard treatments" refers to an identifiable process of manipulating the water's properties, such as contents of carbonate, limestone, minerals, gas etc. In general, the manipulation of the properties can be directly accessed using standard physical, chemical or biological procedures, viz. an analysis in a laboratory. For "soft treatments", such assessments can usually not be undertaken, and to date the process and efficacy of these treatments are unclear or disproven.

One representative of hard treatments is water filters. Water filters are small pots into which tap water is filled, and the filter then removes limestone (see figure 3.1). Usually, the technical unit in the filter needs to be replaced regularly, so the device needs some maintenance. The most prominent brand is "Brita", however, other retail chains sell their own filter brands. Note that limestone filtering can also be achieved with the use of larger in-house facilities.

Another device from this class is soda machines. Soda machines usually require a gas cartridge, and tap water is sparkled with that gas to achieve the taste of carbonated water. Just as for filters, soda machines require some maintenance, as the gas cartridges need replacing and the machines need cleaning in order to avoid bacterial contamination.

The usage of soft-treatment devices among Swiss private and public households seems not to be a peripheral matter. For example, the Grander company (http://www.grander.at/, see figure 3.2), is doing good business in Switzerland. According to the producer, the Grander devices enhance and revitalise water simply by a higher-level information transfer. Repeatedly, there have been publications in

daily newspapers about the Grander technology, and the publishers reported unisono on the dubiousness of these methods. On May 21, 2010, for instance, the "TagesAnzeiger" stated:

> "Das [Grander-]Zauberwasser floss auch mal in Zürich! Was in Winterthur erst jetzt getestet wird, ist in Zürich schon längst wieder passé. Vor 12 Jahren schwammen Badegäste im sogenannten Grander-Wasser – und haben nichts bemerkt." (Fassbind, 2010, addendum by this thesis' author.)

Note, that not a single study has been published with reproducible positive results (see Hametner, 2004, for an overview). To date it can be clearly stated that the efficacy mechanism of Grander is at best unknown. Moreover, an Austrian court decided that the "Grander technology" can legally be called "aus dem Esoterik-Milieu stammender, parawissenschaftlicher Unfug" ("esoteric nonsense", Oberlandesgericht Wien, 2006, addendum by this thesis' author). Although there is no evidence of efficacy, the devices usually sell at high prices and were thereby suspected to be fraud. However, suspicions were rejected by courts because customers have a return option. Yet, the actual danger lies in a different aspect. Public baths for instance clean their water using chloride. If they decide to *substitute* their water-cleaning mechanisms by a Grander device, they run into a risk of actually supplying low-quality water that is possibly contaminated by bacteria.

The class of soft-treatments is certainly not limited to Grander devices. Others appear in public newspapers occasionally, for instance rock crystals or light-water. However, the case of Grander is the most prominent and it illustrates the ambiguity between good sense and esoteric issues in the drinking water realm.

Although the benefit of soft-treatments is much more questionable then the benefit of a hard-treatment, both decisional structures are not obvious. The work presented here tries to clarify usage patterns and seeks to identify links between these patterns and psychological factors.

3.2. Variables under consideration

The research project on drinking water consumption patterns (chapter 2) focused on different aspects of drinking behaviour linked to factors constructed on the basis of the Theory of Planned Behaviour (Ajzen, 1991, see also section 2.2). The empirical work presented in the present chapter should extend the previous work with the focus

Figure 3.1.: A water filter. Water is filled in at the top, diffuses through the technical unit in the middle, and limestone-reduced water is collected at the bottom. (Source: personal photography.)

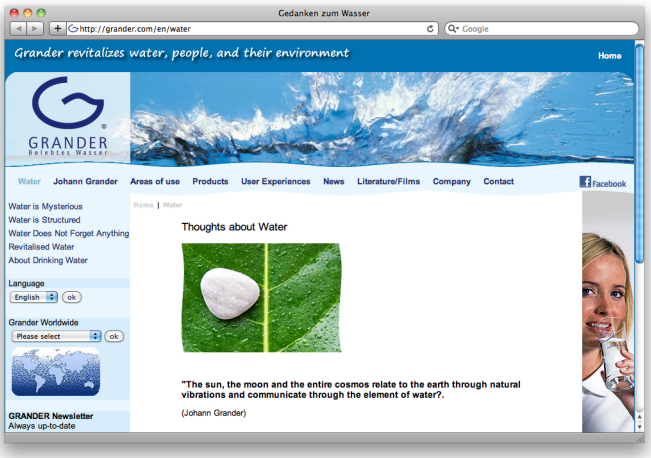

Figure 3.2.: The website of the Grander company (http://www.grander.at/). (Source: personal screenshot at June 26, 2011.)

on treatment devices. The purpose was, first, to explore and describe the current use of treatment devices, and second, to find links between various behavioural indices on one hand and psychological factors on the other, and the application of a treatment.

3.2.1. Dependent variables

The most important dependent variable was whether persons use a treatment, and if so, which one is in use. Three principally different treatments were considered, limestone removing treatments, soda treatments, and "soft treatments" (see section 3.1, page 34 above). All treatment usage patterns were coded as logical variables, where `TRUE` indicated the use and `FALSE` indicated the non-use. Other dependents were included but only for checking inter-relations with the treatment dependents.

The "total bottled water purchase" was recorded as a numeric in litres. Amounts that exceeded 45 litres were cut at 45. The preference for a particular water type was also seen as a dependent variable, and it was coded on two logicals, one with `TRUE` for "bottled water" (versus tap water) and the other with `TRUE` for "with CO_2" (versus without), respectively. The total consumption was included as the sum of all water consumed in litres, regardless of a specific situation. The total consumption index was calculated from the total tap-water drunk compared with the total water drunk, regardless of a specific situation (see also section 2.3).

3.2.2. Factors

Two principally different kinds of factors were included in the analyses, first, factors that can be directly addressed towards treatments (e.g., "Do you use a treatment device?") or, second, factors that are more general (e.g., "How old are you?"). Factors of the first type are of primary interest here, whereas factors of the second type have been investigated thoroughly in the previous chapter; however, a selection of those factors is also included here. Based upon these considerations, I proposed six different factor groups to be related to application of treatment devices: attitudinal beliefs, ability beliefs, and normative beliefs were derived from the Theory of Planned Behaviour; specific emotional, situational, and socio-demographic indices were also considered to be relevant, and were therefore included, too.

Factors of the kind of "attitudinal beliefs" are expressions of how positively or negatively a behaviour is valued. Persons may value the application of a treatment

device or method negatively because of the extra cost and effort required. Or they may value treatment devices positively because they help to avoid buying bottled water. Two such factors were included in the survey, first, whether the respondent had lived in a country with low tap water quality (as a logical with `TRUE`, if this was the case), second, the degree of interest in water topics in general, recoded on a 5-level rating scale ranging from "no interest" to "very much interest".

In the context of treatment devices, ability beliefs express how ready a person feels to use the device or apply such a method. For instance, consumers may feel positively towards integrated limestone filtering systems but they may find it very difficult to install such a system, or they may have no permission by the homeowner to do so. Three factors of this type were included asking for the individual perception of the expense of either tap water, bottled water, or treatment devices. All three factors were coded on 7-level rating scales ranging from "very expensive" to "very cheap".

The third factor group, normative beliefs, encompasses aspects of social pressure. Social pressure is an experienced demand to show (or not) a specific behaviour according to the opinions or expectations of important others. Typically, normative beliefs can be expressed in terms of "It is common to . . . ", "Usually one does . . . " or "I think they want me to . . . ". A consumer may for instance think that they are to use a soda device instead of buying bottles, or, in contrast, a consumer may believe that applying a "soft treatment" (see section 3.1) is generally not very welcome among the family members and friends.

Three such factors were employed here, the "experienced obligation to serve bottled water at home with guests", the "experienced obligation to order bottled water in a restaurant", and the "experienced appropriateness when the respondent is served with tap water at friends' places". The first two factors were recorded on 5-level rating scales, each ranging from "not at all" to "very strong". The third factor was elicited using a 7-level rating scale with labels from "very adequate" to "very misplaced".

Situational determinants can be seen to be relevant only in specific situations (see section 2.2). However, addressing the usage of treatment devices in specific situations was not in the scope of this survey. Yet, the factor groups presented here should not be taken for compartments of items "measuring" the same thing, rather, they represent sectional headers of loose structure among questions in the questionnaire, which addressed principally different things. Thus, for reasons of

clarity and consistency with the previous chapter, the factor group of "situational determinants" was also included.

In the previous chapter, for each of the two water types, tap water and bottled water, the respondents should rate their satisfaction with the type, the trust in its high quality, the frequency of negative experiences with it, and the general knowledge about it. For the exploration of treatments in this chapter, the respondents should rate just the same, but the trust-item was replaced by the individually experienced healthiness of water treated with a treatment. Satisfaction and healthiness was to be evaluated on 7-level rating scales from "very unsatisfied" ("very unhealthy") to "very satisfied" ("very healthy"). All other factors were to be assessed on a 5-level rating scale ranging from "not at all" to "very much/often".

Emotional components have been identified as results of evaluations of particular situations (see section 2.2). As a consequence of these evaluations, persons maintain their behaviour or opinions, or they change them. Reactance for instance (as one emotional component) indicates a cognitive contradiction between the person's plans to behave in a particular way, and the person's perception of degrees of freedom available towards the desired behaviour (see for instance Brehm, 1966; Miron & Brehm, 2006). As an example, before the year of 1989, East-Germans were highly inclined to travel even to countries where access was governmentally restricted. However, after The Wall broke in 1989, many of them did not travel at all: the opportunity to do so was re-established, and consequently there was no need to really act as desired. In the previous analysis, it has been shown that such emotional components can play a role in the decisions of customers towards water-related actions. Therefore, these factors were included here again. "Identity violation", "experienced compel", "anxiety", "jealousy", "sympathy", and "anger" were each recorded on 5-level rating scales, ranging from "not at all" to "very strong/much". "Dissonance" and "fairness" were addressed using 7-level rating scales from "very unpleasant"/"very unfair" to "very pleasant"/"very fair". See also section 2.3 for a more detailed explanation of the items.

When a consumer decides to buy or apply a treatment, several socio-demographic/structural variables can also play a role. An integrated system may be too expensive, or a higher education can lead to different knowledge about treatments. Of course, socio-demographics can hardly be changed directly. If, for example, females feel more positively towards treatments, then this is generally no toehold for males. However, here it was of descriptive interest if such relations pop

up at all, or if there is no link between socio-demographics and the application of treatments. I included age (coded as age in 2008), sex, number of persons in the household, the socio-economic class of the respondents, their education, and the resident's area. The socio-economic class was elicited on a 5-level rating scale from "lower class" to "upper class", education was depicted on a 6-level rating scale from "primary school" to "doctorate", and the residents area was elicited with three levels, "rural area", "suburb", and "city". Note that the area was included as a simple-order factor indicating the degree of urbanisation. All other variables were numeric. Details on the variables can be found in table C.1 in appendix C.

3.3. Analysis of the data at hand

3.3.1. Sample descriptives

The analysis of the use of treatment devices was based upon the data of the survey conducted on the drinking water consumption patterns (chapter 2). There, a questionnaire was sent to 2,844 randomly selected German-speaking persons in Switzerland, encompassed with a cover letter, a reminder, and payoff. By the end of January 2009, a data set of 731 almost complete cases was collected from different Cantons across Switzerland (see section 2.3 for details on the general sample descriptives).

Of the 731 participants in the study, 262 (35.8 %) used a treatment. The most prominent treatment was "filter" (135 persons, 18.5 %), which encompasses limestone reducing filters (e.g., "Brita Filter"). 67 persons (9.2 %) had integrated systems installed in the household to remove limestone. Another 51 persons (6.9 %) used a soda device. The data set contained also 14 persons who apply a "soft treatment" (see section 3.1).

Treatment users as well as non-users did not have a specific area of residence, and they were not of different age, sex, class or education (see table 3.1). The only evident difference was found among the number of persons in the household, where user households had generally five members more than non-user households. However, the effect sizes are very small, and given the large sample sizes ($N_1 \approx 260$, $N_2 \approx 460$), the common significance levels are much too high to be a reasonable cut-off.

Table 3.1.: Descriptives and mean comparisons of demographical variables of treatment users versus non-users. Students' t-tests were applied for the mean comparisons. Displayed are group means of users and non-users (standard deviations in brackets), minimum and maximum values of the variables, significance statistics and the effect size d (Cohen, 1988).

Variable	Users		Non-users		Min	Max	t	df	p	d
	M	SD	M	SD						
Resident's area	1.631	(0.792)	1.803	(0.805)	1	3	−2.794	542.607	.005	0.153
Age	50.977	(14.746)	52.607	(16.275)	14	90	−1.377	583.845	.169	0.074
Sex	1.523	(0.500)	1.507	(0.500)	1	2	−0.400	540.108	.689	0.022
N Persons in the household	2.747	(1.294)	2.325	(1.185)	1	8	4.348	500.419	<.001	−0.241
Socio-economic class	2.988	(0.706)	2.968	(0.693)	1	5	0.377	526.445	.706	−0.021
Education	3.397	(1.095)	3.328	(1.191)	1	6	0.794	580.188	.427	−0.043

3.3.2. Usage of treatments and link to other dependent variables

Table 3.2 shows the correlations between treatment variables and other dependent variables in the data set. Unsurprisingly, the correlations between the general treatment usage indicator and other treatment variables are high, since the general indicator subsumes the use of treatments recorded in the other variables in more detail. However, there is a negative relation between the use of an integrated system and the use of filters. Apparently, users of fixed installed household appliances for limestone removal do not need additional mobile devices for the same task.

Except the preference for sparkling, other dependent variables were unrelated to the general usage indicator. The correlation between usage and the preference was very small, but the correlation between the soda indicator and the preference was even higher indicating that customers who preferred sparkling were the ones who bought and used a soda device.

The statement appears trivial, however, the interesting aspect is that the correlation was not perfect. On one hand, 141 respondents (about 20 % of the total sample) preferred sparkling but did not use a soda device. Although about half of them responded to buy nine or more litres of bottled water, this group was not generally the "high-purchase" group. On the other hand, 22 respondents did not prefer sparkling but were soda users. Given the data at hand, it is unclear how both subgroups reason their consumption decision. Yet, the correlation between soda usage and bottled water purchase is negative, which means that users of soda devices substituted their bottled water purchase by sparkling tap water.

3.3.3. Usage and non-usage of a treatment

One of the goals of the work presented here was to explore links between several psychological factors and the use or non-use of treatment devices. Generally, any variable in the data set was suspect to reveal a relevant interrelation to the use or non-use. However, I excluded the usage indicators from this analysis, because the general usage indicator was already a conglomerate of the recorded answers.

I also excluded treatment-specific factors. Responses to these items were only collected from treatment users. First, it was unknown what non-users would have responded to the particular questions in the questionnaire. Second, including these items would have diminished the sample that was available for the analyses dramatically.

Table 3.2.: Pearson correlations among the dependent variables.

Nr.	Label/Nr.	1	2	3	4	5	6	7	8	9	10
1	Any treatment used	1	0.43^{***}	0.64^{***}	0.37^{***}	0.19^{***}	0.03	0.01	−0.01	0.14^{***}	−0.02
2	Integrated system used		1	-0.10^{**}	−0.03	−0.04	−0.03	−0.05	0.00	0.05	0.08^{*}
3	Filter used			1	−0.05	−0.04	0.05	-0.08^{*}	0.04	0.04	0.04
4	Soda used				1	−0.04	0.02	0.11^{**}	−0.07	0.22^{***}	-0.14^{***}
5	Soft treatment					1	0.04	0.12^{**}	−0.06	−0.05	-0.10^{*}
6	Total consumption						1	−0.05	0.03	0.00	0.14^{***}
7	Consumption ratio							1	-0.49^{***}	-0.29^{***}	-0.69^{***}
8	Prefer bottles								1	0.49^{***}	0.43^{***}
9	Prefer sparkling									1	0.21^{***}
10	Bottles purchase										1

***: $p < .001$, **: $p < .01$, *: $p < .05$, all others not significant

Table 3.3.: Binary logistic regression (stepwise backward) on the use or non-use of a treatment device among Swiss consumers. For better display, coefficients and standard errors were multiplied by 100.

Variable	B (×100)	SE (×100)	e^B	p
Constant	−206.183	45.941	0.127	0.000
Structural determinants				
Resident's area	−0.524	0.229	0.995	.022
Situational determinants				
Satisfaction with tap water	−0.800	0.309	0.992	.010
Knowledge abt. tap water	−1.824	0.504	0.982	.000
Knowledge abt. treatments	4.986	0.526	1.051	.000
Emotional components				
Anger	0.731	0.349	1.007	.036
Demographics				
N Persons in the household	1.918	0.584	1.019	.001

$R^2_{CS}(689) = .198$, $R^2_N(689) = .271.$, $\chi^2(1) = 85.73$, $(p < .001)$.

The remaining variables were included in a data subset and linked to the general treatment-usage indicator. A backward stepwise binary logistic regression (AIC selection method) was applied to this data. The preliminary model was examined for significant/relevant regressors. Cases with missing values were excluded. Regressors were controlled for collinearity (GVIF < 2, see Fox & Monette, 1992). Relevant regressors were then employed in a refined model. The resulting regression is displayed in table 3.3.

A set of six variables showed significant coefficients linked to the indicator of non-user versus user. The resident's area had a negative coefficient, which means that residents of urban areas are more unlikely to be treatment users, where residents of rural areas are more likely to be users. More satisfaction with tap water and more knowledge about tap water, both also made it more unlikely for a respondent to be

a user of a treatment. Apparently, if one is highly satisfied with, and knows much about tap water, there would hardly be a need for treating the water. Knowledge about treatments, in contrast, makes it more likely to be a user, and the coefficient is much higher than any of the ones above. However, the link can be read reverse, and it makes sense that users of treatments must at least know how their treatments function, where non-users do not need such a skill and may find it redundant to achieve such knowledge if they are already happy with the state of affairs.

Anger seems to have a positive relation to the usage. The item was presented in a fictive situation stating that the drinking water supplier would reduce the quality and force the consumers to treat themselves, and the question then was, how such a condition would evoke anger. The coefficient found here reads as if treatment users apply their methods and devices as a precaution because they are more realistically afraid of such a policy.

Also, the number of persons in ones household seemed to increase the probability of using a treatment. Because buying bottled water requires more effort and resources, it may be reasonable that treatment users try to avoid this overload in that they use treatment devices.

However, the pseudo-determination-coefficients are small. Except for knowledge about treatments with an effect size of $d = -0.906$, the effect sizes of the other regressors were small ($d < .2$). The χ^2 of the predicted-observed table is significant merely due to the large sample size; however, only about 75 % of the cases were predicted correctly.

3.3.4. Treatment-specific usage factors

In the previous section I have examined factors that show a link to the use or non-use of a treatment among the participants in the study. However, in section 3.1 above I speculated that the usage of one or another treatment could have very different motivations. Factors relevant for the use of, say, soda may not be relevant for the use of, say, filter. So, considering the different purposes of the treatments under study here, using one or the other treatment does not mean using the one *instead* of the other.

Therefore, either treatment was analysed in comparison between users and non-users of this treatment regardless of what other treatments the user applied or if a treatment was applied at all. That in turn required the analyses to be performed with all treatment-unspecific factors, since non-users did not supply answers to treatment-

specific questions.

3.3.4.1. Limestone removing treatments

The largest user group among the treaters applied some kind of limestone-removing treatment to the drinking water ($n = 198$). Two such treatment types were identified: filters and integrated systems (see section 3.1, page 34). Yet, the purpose of the application remains the same across these two treatment classes, that is, removing or reducing limestone. Therefore, in the scope of the analysis here they were combined. Other treatments and dependent variables were excluded, and treatment-specific variables were excluded as well.

First, I used the model described above to test whether it delivers a good prediction for the data here. A χ^2-test on the predicted-observed table revealed an index of $\chi^2(1) = 54.76$, $p < .001$. 494 cases (about 72 %) were correctly identified, with 90 users and 404 non-users. In contrast, about 28 % were wrong predictions with 14 % missed signals and 14 % false positives.

Because the prediction showed no better performance, a limestone-specific model was built using a backward stepwise binary logistic regression (AIC selection method) in a second step. The preliminary model was examined for significant/relevant regressors, cases with missing values were excluded, and the regressors were controlled for collinearity (GVIF < 2, Fox & Monette, 1992). Relevant regressors were then employed in a refined model. The resulting regression is displayed in table 3.4.

Seven factors showed a relevant contribution to the regression. The resident's area had a negative effect, which suggests that residents of urban areas are more unlikely to apply a limestone filter. Yet, we may note that residents of urban areas are more likely to be tenants rather than homeowners. In light of integrated systems, they may not know whether one such system is installed or they may not have permission to install one on their own. However, because a large proportion of limestone treatments were filters, the statement made here retains some validity.

Satisfaction with tap water and knowledge about tap water showed a negative relation to a respondent being a user of limestone treatment. The coefficients read as if limestone treatment users know less about tap water and are less satisfied with it. While the second statement appears to be sensible in terms of 'they remove limestone because they are not satisfied', the first statement leaves room for speculating that these users apply a filter *precautionally* just because they do not know much about

Table 3.4.: Binary logistic regression (stepwise backward) on the use or non-use of limestone-removal treatments among Swiss consumers. For better display, coefficients and standard errors were multiplied by 100.

Variable	B (×100)	SE (×100)	e^B	p
Constant	−157.548	50.864	0.207	.002
Structural determinants				
Resident's area	−0.533	0.243	0.995	.029
Situational determinants				
Satisfaction with tap water	−0.879	0.312	0.991	.005
Knowledge abt. tap water	−1.650	0.520	0.984	.001
Knowledge abt. treatments	4.088	0.515	1.042	<.001
Emotional components				
Anger	0.986	0.397	1.010	.013
Compel	−0.840	0.444	0.992	.058
Demographics				
N Persons in the household	1.497	0.600	1.015	.013

$R^2_{CS}(686) = .142$, $R^2_N(686) = .205$, $\chi^2(1) = 44.9$, $(p < .001)$.

their tap water.

The highest coefficient was found for knowledge about treatments. Expectedly, much knowledge fosters a respondent's probability to be a user of this treatment.

Three other variables contributed to the regression results. Like in the analysis of use or non-use (see section 3.3.3), the number of persons in the household, and anger had positive relations to the likelihood of being a limestone treatment user. Compel instead showed a negative coefficient. Compel was an emotional component and was presented in a fictive situation. The respondents were asked to imagine that the tap water quality will not be guaranteed anymore in the future. As a consequence, said the cover story, they were requested to prepare drinking-water quality themselves. The question then was how strong they would feel compelled to change their behaviour. The negative coefficient thus reads that users of a limestone treatment felt much less compelled to change any behaviour, which is perfectly sensible: if one already treats water there is no need to change anything if the water quality is changed. The positive coefficient along the anger regressor supports the idea presented in the previous section.

Compared to the model above, the predictive quality did not increase. Although the ratio of correct predictions reduced from 28 % to 25 %, the number of missed signals grew to 20 %. Also, the pseudo-determination-coefficients are small and the χ^2 index is significant merely due to the large sample size.

3.3.4.2. Soda treatments

51 persons in the sample used a soda treatment device. Like along the limestone treatment users, the general usage model was applied for prediction of the soda treatment users. A χ^2-test on the predicted-observed table revealed an index of $\chi^2(1) = 7.47$, $p = .006$. 497 cases (about 72 %) were correctly identified, with 22 being users and 475 being non-users. That in turn means that about half of the soda *users* were not identified (4 % missed signals and 24 % false positives). Therefore, like above, a backward stepwise binary logistic regression (AIC selection method) was applied to the data set (see table 3.5).

Because too few respondents used a soda device at all, the analyses could not reveal a useful regression model. The model includes two non-significant factors. Only one user was identified at all, and the model's stability is almost only based upon the prediction of the non-users. Apparently, the data set used in the analysis here did not contain informative items about the users and non-users of a soda

Table 3.5.: Binary logistic regression (stepwise backward) on the use or non-use of a soda treatment among Swiss consumers. For better display, coefficients and standard errors were multiplied by 100.

Variable	B (×100)	SE (×100)	e^B	p
Constant	−370.520	115.998	0.025	.001
Structural determinants				
Resident's area	−0.856	0.451	0.991	.058
Normative beliefs				
Obligation to serve bottled water	−1.349	0.590	0.987	.022
Situational determinants				
Satisfaction with tap water	−1.396	0.722	0.986	.053
Satisfaction with bottled water	1.498	0.814	1.015	.066
Knowledge abt. treatments	1.200	0.741	1.012	.105
Emotional components				
Sympathy	1.370	0.793	1.014	0.084
Demographics				
Age	−3.432	1.206	0.966	.004
Education	1.822	0.784	1.018	.020

$R^2_{CS}(596) = .06$, $R^2_N(596) = .147$, $\chi^2(1) = 2.74$, $(p = .09)$.

treatment.

3.3.4.3. Soft treatments

The data set also contained 14 cases with soft-treatments. The term "soft-treatment" refers to a device or method with no scientific or logic proof that the proposed efficacy mechanism exists or can work (see also section 3.1 page 34). Seven participants explicitly mentioned Grander as their treatment device, the other listings included treatments such as gemstones or rock crystals.

Based upon the lessons from the analysis above, I did not perform a linear model analysis. However, the general regression model for users versus non-users of treatment was also applied here and assessed for predictive quality. Of the 14 cases with such a treatment, 8 were correctly identified as users, 5 were missed signals, and one was excluded due to missing values along the predictors.

The χ^2 statistics revealed an index of $\chi^2 = 6.25$, ($p = .012$) which still indicates a significant relation between the observed values and the predicted ones. However, this indication is almost purely based upon the correctly identified non-users. Moreover, 179 non-users were wrongly suspected to be users according to the prediction. Again, using the general model will unveil some users, but the stake of wrongly suspected non-users and missed users is much to high for the model to be useful.

3.3.5. Treaters profiles

Inspecting the prediction of particular treatments so far, I want to emphasise that the data at hand did not contain treatment-unspecific items that allow for a reliable prediction of users, neither in general nor concerning particular treatments. However, the data set contained treatment-specific items, but these items were only answered by treatment users, so a comparison with non-users is not possible. Also, a comparison *between treatments* is not very informative because of the various purposes of the treatments and thus various motives to apply them. Thus, the aim of this part of the analysis was to emphasise some treatment-specific profile aspects of users of the various treatments. Figure 3.3 displays the means and standard deviations of the treatment-specific items per treatment user group.

It is apparent that the profiles of limestone and soda treatment users are very similar, and that the profile of soft treatment users differs remarkably at the knowledge and health item. In terms of a tendency, this difference reads that soft-

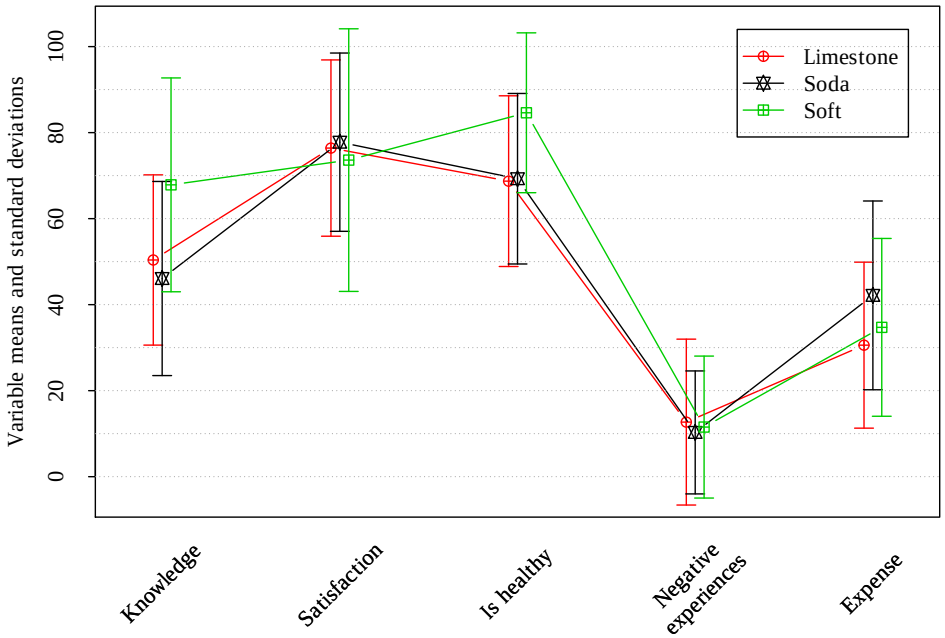

Figure 3.3.: Profiles of treatment-specific factors among treatment users. All items were scaled to an interval between $(0; 100)$. Displayed are item means per user group and the standard deviations.

treatment users responded to have more knowledge about (their) treatments, and that they rate their soft-treatment generally healthier than users of other treatments do.

However, no mean is significantly different from another and – based upon the present data – solid statistical conclusions cannot be drawn. Yet, it could be of some interest whether the profile differences will sharpen if more data is collected about users of soft-treatments in future research.

3.4. Discussion and conclusions

The aim of the empirical work presented in this chapter was to analyse usage patterns and motives of application of treatment devices or methods among Swiss consumers. Two classes of such devices were identified, hard-treatments (with natural scientific justification) and soft-treatments (which lack such a background).

About one-in-three respondents used a treatment device. Only some participants used a soft-treatment ($n = 14$), and soda was rather rarely in use (less then one in ten). The large stake of users applied hard-treatments, and the most prominent was limestone-removing appliances. These appliances came in two forms: filters (e.g., Brita) and integrated systems installed in the household. In the scope of this analysis, both were seen as one type of treatment, just because they all remove limestone. However, different notions are valid as well. A filter device must be applied volitionally, since users must take the filter device, fill in water, wait for the filtered water to be ready, and then (more or less exclusively) use the filtered water. An integrated system in contrast is some fixed appliance installed somewhere in the households water cycle. Users may, generally, neither be willing nor unwilling to use water through the appliance, instead, all water is filtered automatically. Therefore, from this point of view users of a filter and users of integrated systems could be seen as being different. Yet, the advantage of the approach used here lay in an increase of the user-ratio among the dependent variable in the linear model analysis.

To some extent, the application of treatments could be attributed to psychologically relevant factors. The most prominent factor was knowledge about treatments, where higher knowledge was related to a higher likelihood to use a treatment. However, it must be emphasised that the course of cause is not clear. On one hand, users may know what treatments are good for and therefore apply them. On the other hand, users may have simply used treatments and, eventually, gathered knowledge

about functionality with more usage experience.

Other prominent factors included satisfaction with tap water and bottled water, but also emotional factors were found to have an influence. However, the overall usefulness of the usage-non-usage model was limited, and so was the usefulness of treatment-specific regression equations. No application of the general model for prediction delivered a quantity of more than 75 % correct predictions – with most of the prediction ratios being based upon the non-users. The predictions with treatment-specific models were even worse.

Especially when considering the application of limestone-removing devices, one could conclude that the user's decision is based upon the water source in the first place. The questionnaire employed in the current analysis contained self-reporting questions about the water source in the respondent's household. However, detailed knowledge about the water source seemed not to be common among the respondents, and thus many of them missed the answer there. Given the few valid responses to that question, a link between water source and the application of a treatment was not possible to establish.

One focus in the analysis lay at the application of soft treatments. In section 3.1, I have already elaborated on the use of the Grander technology in Switzerland, and seven participants in the sample used this treatment. On one hand, the sample was much too small to gain solid knowledge about psychological backgrounds of such a decision. On the other hand, profiling treatment-specific factors of soft-treatment users against hard-treatment users showed some tendency of differences. Perhaps such tendencies become much stronger if a larger sample of soft-treatment users was employed.

Yet, it must be noted that the realm of drinking-water treatment is not the only one where soft treatments can be found. In 2001, Wehrli et al. assessed "Penac", a substance that had been sold by the German company "Plocher" (http://www.plocher.de/). According to the producer, Penac could be utilised to revitalise lakes and reduce odour nuisance. The product had been under constant critique in the public media. But even after Wehrli and his colleagues natural-scientifically adjudged Penac to be effectless it continued selling.

To summarise, a rather small proportion of Swiss customers apply treatments to their water. In the case of hard-treatments there is solid scientific reason to do so but the psychological factors employed in the present study could not uncover important links. Yet, in the case of soft-treatments, the solid scientific basis of

functionality is missing. However, for some reason persons insist on using these technologies to enhance simple pure water. It is apparent that the insistence is not based upon logically derived valid reasoning. However, discovering the causes behind this behaviour remains a challenge for future research.

4. Psychological factors of the use of Point-of-Use-Systems in Nairobi (Kenya)

Preface

In the previous chapter, I have analysed factors and motives for the application of treatment devices among German speaking Swiss. Although health aspects were inspected there, they were not seen to be a crucial aspect in the user's decision to apply a treatment. Currently, tap water in Switzerland is drinkable and – except for rare accidents (e.g., Maurer & Stürchler, 2000) – nobody would suffer from diarrhoeal diseases due to consumption of a regularly contaminated drinking-water.

In this chapter I want to strengthen the focus on health-relevant decisions to apply a treatment device *because* there is good reason to suspect the available drinking water to be of poor quality. Indeed, just like in the previous analyses, the general focus lies on psychological factors that relate to the users' decisions.

The present text is a draft version planned for publication. The article's co-authors were Hans-Joachim Mosler[1] and Christian Zurbruegg[2].

Abstract

Health threats due to unsafe and contaminated drinking water is a serious problem. One effective method to avert such threats is to provide point-of-use-systems (PoUS). PoUS help users to clean their water themselves at the point of consumption. The promotion of PoUS requires knowledge of the current state of affairs, that is, the types and number of PoUS already in use. It also requires knowledge about psychological factors that could influence the acceptance and dissemination of such

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devices. In the present study we try to shed light on these aspects in six socio-economically diverse estates in Nairobi, Kenya. In 2007, we surveyed more than 600 households on the usage patterns of and motives towards PoUS. Analyses verify a well-established practice of applying PoUS among the residents, yet, with potential to be enhanced in some estates. Regressions suggest that cost-benefit factors and social aspects (image, sympathy) play a key role in using a PoUS. The results are discussed and recommendations are made.

4.1. Introduction

Contaminated drinking water causes millions of deaths every year (Balbus & Lang, 2001; UNICEF, 2006). Cleaner and safer drinking water can prevent serious life-threatening diseases such as diarrhoea (E. Mintz et al., 2001; Crump et al., 2005; Boschi-Pinto, Young & Black, 2010). As a consequence, one key aspect of public-health-related action that is currently undertaken worldwide is the improvement of water provision targeting both quantity and quality.

Such action includes strong research on various point-of-use systems (PoUS, e.g., Arnold & Colford, 2007; Hunter, 2009; E. D. Mintz, Reiff & Tauxe, 1995). A point of use system is a technology or device that cleans water by removing contaminants of various types. Because a PoUS is designed for the end-user application (e.g., Clasen & Cairncross, 2004), PoUS users can easily circumvent infrastructural obstacles such as unreliable or broken pipes or variations in water pressure and quality. Moreover, especially for developing countries, PoUS are designed to be easily applied, inexpensive, and robust with little need for maintenance or repairing services, and therefore PoUS are good alternatives to enhance hygienic conditions (E. Mintz et al., 2001).

A variety of PoUS in several environmental settings have been studied. In 2010 for instance, Albert et al. assessed the application of PoUS in rural Kenya. However, they focused on commercially distributed devices only, and it can be hypothesised that low-income households cannot afford these devices. Alternatively, effective "self-made" PoUS are also available. Solar water disinfection (SODIS) for instance is a very easy and cheap, yet effective PoUS (Conroy, Meegan, Joyce, McGuigan & Barnes, 1996). Water is filled into a PET bottle, exposed to sun light for a fixed time, and the resulting product is germ-free non-contaminated water ready to be consumed (see figure 4.1 for an illustration).

Figure 4.1.: SODIS bottles on a roof in Kibera (Nairobi, Kenya). PET bottles are filled with water, exposed to sun light for a fixed time, and the result is drinkable water. (Source: personal photography)

Yet, still many technologically-oriented publications assume that a new technology manufactured to solve a particular problem *must be adopted* simply because it settles the targeted task. If not, the misfit between the technologically-driven expectation and the actual observation is not rarely summarised with "we do not understand the factors that influence preference for and adoption of these technologies by target end-users" (Albert et al., 2010, p. 4426). Such assumptions and conclusions can be misleading. Despite effectiveness and easiness, PoUS do not implement automatically, and it has been acknowledged that implementation requires more sophisticated strategies. In research and intervention campaigns, social scientific projects have identified relevant key factors and motives for people to adopt new behaviour such as applying a PoUS (e.g., Altherr et al., 2008; Schwarz & Ernst, 2008; Tobias & Berg, 2010). These key factors should be incorporated into the present study.

4.1.1. Theoretical and factorial background

Above, we have illustrated that research on PoUS usage behaviour requires the detection and understanding of the current state of affairs concerning practicability, effectiveness, and end-user's behaviour and acceptance in realms where new technologies should be implemented or existing ones are examined. Social-scientific theories provide frameworks for theoretical conceptualisations of this research conduct (see Jackson, 2005, for an overview). Among the most prominent and promising frame-

works are the Protection Motivation Theory (PMT, Rogers & Prentice-Dunn, 1997), the Health Action Process Approach (HAPA, Schwarzer, 2008), and the Theory of Planned Behavior (TPB, Ajzen, 1991).

The first two theories target health behaviour explicitly, while the latter is a more general model encompassing factors to explain psychological processes and behavioural output. Various studies have revealed the usefulness of these frameworks (e.g., Albarracin, Johnson, Fishbein & Muellerieile, 2001; Floyd, Prentice-Dunn & Rogers, 2000; Schwarzer, 2008). The items used in the present study were derived from these three theoretical conceptualisations.

Items in the factor group of vulnerability (PMT, HAPA) express the persons' belief of the risk of a potential threat. Drinking untreated water for instance, could evoke the belief that bacteria in the water cause diarrhoea, but the subjective risk could vary. Thus, the application of a PoUS could vary according to the perception of the potential threat.

The factor group of instrumental beliefs (TPB) summarises items about the utility of a particular behaviour and its costs. Usually they are expressed in terms of "doing A is a good thing" or "having B is important". Valuing healthy drinking water as important is, for instance, an expression of the high utility of healthy drinking water to a person. The magnitude of this value could influence the PoUS application. Affective beliefs (also TPB) add emotions to the behaviour under consideration. As an example, a family could of course see the utility of using a PoUS, but the members usually do not like to apply it.

Three distinct norm groups (TPB) have been included. Factors that fall under the group of descriptive norms display the person's perception of "usually performed" behaviour. SODIS for instance requires the exposure of bottles, and a person could realise these bottles on the roofs all over the community. Factors among the group of injunctive norms instead express the person's subjective perception of whether a particular behaviour is approved or disapproved of the community members. A family could, for instance, see the usefulness of treating water with a PoUS, and they could also feel positively towards the application, however, they experience "treating water" as some behaviour that is usually "not to be done" among the community members. Factors from the group of personal norms express what persons consider right for themselves, regardless of the formerly described two norms. These factors usually include items expressing responsibility or concerns.

Yet, norms can be sustained and amplified depending on the frequency of com-

munication – or, in contrast, be forgotten. Therefore, frequency of communication builds a separate factor group, usually holding items of numbers of times.

Items in the factor group of response efficacy (TPB) display the perceived likelihood that the behaviour under consideration will produce an expected outcome. In terms of the application of a PoUS, such statements may have two interpretations. On one hand, an effective PoUS could be abandoned because the user does not think that the PoUS de-contaminates the water. On the other hand, a PoUS could be applied that a user indeed expects to be effective, but that is actually not.

The factor group of controllability (TPB) encompasses items expressing how strong a person has volitional influence on a behaviour. The application of a PoUS may be one behaviour totally up to the user, however, if water is not available continuously, no handle remains for the user.

A specific group of emotional components was added to the design. Emotional components describe results of a cognitive evaluation of a particular behaviour or observation. The behaviour or observation can point towards the person's plans or against them. As a result of this evaluation, emotional reactions are experienced, and these in turn motivate to maintain or change the behaviour, or to seek this situation or leave it. In addition, an observer in such a situation can maintain or change the personal evaluation of the situation.

Inequity for instance is caused by the individual's perception of unevenly distributed resources available to persons (Adams, 1963; Adams, 1965; Homans, 1968; Walster et al., 1973). The perception leads to a cognitive discrepancy between an expected distribution quota and an observed one. In the scope of this article's objective, a municipal provider may renew pipes and foster delivery in a particular estate, while no renewal action is undertaken in a second estate with a similar environment. The discrepancy results in an emotional feeling of inconvenience, and as a result a variety of actions can be provoked towards use or non-use of a PoUS, or persons could simply change their evaluation of similarity between the environments. The important fact is that such a cognitive process is not necessarily limited to the person in the worse condition, but could also be invoked among advantageous persons. These persons, in turn, could apply PoUS simply because of a need towards establishing equity (experienced), not because of an actual need to treat water.

Socio-demographic variables such as sex or age had also been under consideration. However, when it comes to change of action, socio-demographics are the most unsuitable targets for influence, since one cannot shift from being young to being old

except by waiting, let alone the move from being male to being female. However, in the scope of drinking behaviour and health behaviour, socio-demographic variables have been shown to account for various differences (e.g., Syme & Williams, 1993) and were, therefore, included in our design.

4.1.2. The present study

The study presented here was conducted along residents from six socio-economically very diverse estates in Nairobi, Kenya. Nairobi is one of the largest municipalities in East Africa with wide income disparities. The estates' residences vary from very wealthy mansions through well-designed city apartment blocks to simple booths in slums. As the quarters diverge, so do the socio-economical backgrounds of the inhabitants. In Runda, for instance, a wealthy estate with large mansions (see figure 4.2 for an example), residents are usually company owners, managing personnel or government's employees with income suspected to be more than 100,000 Ksh per month. Water in Runda is provided by the estate's private water company, Runda Waters. Hazina, as a second example, is a fenced and watched compound of middle class apartment blocks, and rents can usually only be afforded with income starting at 50,000 Ksh per month. Each apartment is connected to the municipal water company, the Nairobi City Water and Sewerage Company Ltd. In contrast, Kibera, the largest slum in Africa, has housing facilities starting from 1,000 Ksh monthly, hardly one with a private tap (see figure 4.3 for an illustration). Instead, water can be obtained through public taps on some spots, and water vendors on others.

By surveying households from this socio-economically and infra-structurally diverse town on the reasons and motives of use or non-use of PoUS, we gain insight into the current state of affairs along a cross-section of residents regardless of their socio-economic capabilities.

In particular, we speculated (1) that PoUS availability and usage varies widely and systematically across different socio-economic classes, (2) that distinct water consumption behaviours (treated water consumption versus untreated water consumption) is related to the application or non-application of PoUS, and (3) that PoUS application is related to the psychological variables derived from the factor groups introduced above, both in general usage patterns and in the choice between one or another alternative.

Yet, it must be re-emphasised that the focus of the present work lay on the detection of user patterns and their possible relations to the theoretical concepts.

Figure 4.2.: Mansion in the estate of Runda, Nairobi, Kenya. (Source: http://www.rundaestate.com, retrieved 27 Jul 2011.)

Figure 4.3.: Public tap in Kibera, Nairobi, Kenya. (Source: personal photography.)

Thus, although conclusions towards causal relations between variables in the patterns discovered here can be drawn, we followed an exploratory approach and the conclusions do not display causal relations.

4.2. Methods

4.2.1. Estates and participants

From October 26th to November 12th 2007, 695 households in six socio-economically different estates in Nairobi, Kenya, were asked for an interview concerning various aspects of the usage of Point-of-Use-Systems (PoUS). The estates were pre-selected and labelled by researchers from Eawag together with local research collaborators from the University of Nairobi (UoN) and the Kenyan Water And Health Organisation (KWAHO, http://www.kwaho.org/). The estates' labels ranged from "very low class" to "very high class" (see table 4.1). Selection and labelling was based upon the overall appearance and the experiences of the Kenyan research colleagues.

The participating households were selected using the random-route method (Hoffmeyer-Zlotnik, 2003). In Hazina and Karen, all available residents were interviewed. 61 households rejected the request. 97 cases were excluded because of inconsistencies or incomplete responses.

Of the remaining 537 cases 62.4 % were female, the mean age per household varied between 22 and 31 years of age ($M = 26.1$, $SD = 1.99$), and the household sizes were about 4.4 members ($SD = 1.99$; see table 4.1). The educational level was generally high: 34 % had an university degree, one in four studied at the college, and another one in four went to secondary school. Almost half of the participants were employed, one in five were self-employed, and 15 % were housewives. More than half of the respondents had more than 50,000 Ksh income per month (about 550 €), yet one in four had an income below 10,000 Ksh.

4.2.2. Questionnaire and variables

The interviews followed a 20-page structured questionnaire with more than 100 questions concerning water treating behaviour and water consuming behaviour, personal behaviour reasons, hygienic aspects of daily life, illness issues, and demographic data. Some of the questions were directly related to one or another PoUS, that is, they were PoUS-specific in contrast to PoUS-unspecific items that applied regardless

Table 4.1.: Estates and descriptives. Per estate, the pre-labelled socio-economic class, the number of rejections, the number of interviewed residents, the ratio of female interviewees, the mean number of household members, and mean age of household members, the mean educational level and the income class level (as derived from the factors), and the mean number of rooms are shown (standard deviations in brackets).

Estate	Class	Rejections	N	Female	Members	Mean age	Edu. level	Income class	N. of rooms
Kibera	very low	0	97	74.2	4.49 (1.99)	21.7 (6.7)	2.7 (0.78)	2.00 (0.81)	1.59 (1.36)
Makongeni	low	2	86	70.9	3.78 (2.08)	23.6 (8.3)	2.8 (0.88)	2.11 (0.93)	1.36 (0.61)
Buru Buru	middle	13	92	63.0	4.89 (1.98)	28.1 (8.9)	3.88 (0.75)	6.08 (0.89)	5.97 (1.21)
Hazina	upper middle	8	102	68.6	4.14 (1.79)	25.2 (6.5)	4.45 (0.68)	6.24 (1.03)	5.53 (1.1)
Karen	high	8	83	59.0	4.45 (1.76)	28.5 (10.6)	4.02 (1.13)	5.64 (2.09)	7.11 (3.85)
Runda	very high	30	77	32.5	4.81 (2.16)	31.1 (10.7)	4.88 (0.36)	6.95 (0.27)	10.09 (3.27)
All		61	537	62.4	4.42 (1.99)	26.2 (2.0)	3.77 (1.99)	4.82 (9.17)	5.14 (1.99)

of the PoUS known or used.

The questionnaire was loosely segmented into various sections to give a narrative order. It consisted of two dependent variables, ten factor groups, and a set of demographic variables (see table C.2 in appendix C). Variables for the present analysis were pre-selected according to their relevancy and the number of missing answers contained.

As the first dependent variable, the amount of treated versus untreated water in litres per day was elicited. The second dependent variable recorded whether participants know or use one out of ten available PoUS. The factor group of vulnerability contained only one item, the belief whether drinking untreated water makes more or less healthy. Answers were recorded on a seven-level rating scale ranging from "a lot healthier" to "a lot more unhealthy".

The factor group of instrumental beliefs held two PoUS-unspecific and eight PoUS-specific items. The importance of healthy drinking water was recorded on a four-level rating scale ("not important at all" to "very important"). The cost-value-ratio of the treating behaviour was recorded on a seven-level rating scale labelled from "it costs a lot more than it is worth" to "it is worth a lot more than it costs". PoUS-specific items were asked in relation to the particular PoUS known to or used by the user. The easiness of use, cheapness, reliability, potential power of enhancing odour, flavour and appearance, and the belief that the PoUS makes one healthier were recorded on 7-level rating scales each (very much the attribute to not at all the attribute), while the time required by application was recorded on four levels ("no time" to "very much time").

Two items addressed the factor group of affective beliefs, viz. the belief whether it is good to treat water, and the belief whether it is good to talk about water quality issues with friends, both items with a 7-level rating scale ranging from "very bad" to "very good".

The factor group of descriptive norms consisted of one PoUS-specific item, that is, the number of other persons who use this PoUS known to the participant. Also, the group of injunctive norms consisted of one such PoUS-specific item. The item here was, what others think about the participants knowing that they use the PoUS. The item was provided with a 7-level scale ("very negatively" to "very positively"). One additional item was included in this factor group, that is, how much their own drinking water behaviour increases their social image – recorded with a 7-level scale labelled from "very much decreasing" to "very much increasing". Only one item from

personal norms was added. The question was how responsible the participants felt concerning the health of them and their family ("not at all" to "very responsible"). In the group of frequency of communication one item was added to the analysis. The variable held the number and times of household members suffering from diseases due to drinking water consumption, and the answers were recorded as numbers.

Response efficacy was a factor group with one PoUS-specific item. The question asked how effectively the PoUS works, and answers were coded on seven levels ranging from "very ineffectively" to "very effectively".

The factor group of controllability contained PoUS-unspecific and PoUS-specific items. The number of hours with continuously available drinking water (coded as a number), and responsibility for the drinking water situation (4-level scale from "not responsible" to "very responsible") were PoUS-unspecific items, whereas the availability of the PoUS (coded with seven levels from "not available" to "very available") was PoUS-specific.

Six emotional items were deployed: the amount of experienced anxiety about illnesses related to a contamination of your drinking water, the strength of compulsion felt towards the use of any household drinking water treatment, the belief of the amount of increase or decrease of ones self-esteem due to the drinking water behaviour and/or situation, the experienced superiority or inferiority linked to drinking water situation in the household, the strength of worries experienced when thinking about the drinking water situation, and the amount of sympathy or jealousy experienced when thinking about the drinking water situation of others. Anxiety, compulsion, worry, and sympathy were recorded at 4-level rating scales with labels from "no" (anxiety, compulsion, etc.) to "very much". Self-esteem and superiority were recorded with seven levels labelled from "very much decrease"/"very inferior" to "very much increase"/"very superior".

Nine demographic items were added here, the residential estate, sex, highest education degree, current occupation, the number of persons in the household, the household's mean age, the number of rooms available to the household, the income class, and the primary water source. For a description of all items see table C.2 in appendix C.

4.2.3. Interviews

Students from the University of Nairobi (UoN), and Kenyan Water and Health Organization (KWAHO) research-assistants conducted the interviews using the ques-

tionnaire. Because the questionnaire's language was English, interviewers were required to translate questions and answers on-the-fly into the appropriate language in some estates, e.g. Kiswahili or Nubian in Kibera. Therefore, all interviewers and supervisors passed a seven-day training, which included wording, understanding, and translation aspects of the questionnaire, as well as a two-day interview trip in Kibera and Hazina. The training was given by all research collaborators.

All interviews were conducted through group tours to one particular area a day. The interview tours were scheduled according to the expected availability of the residents, with no interview before 9 a.m. and after 5 p.m. The interviews were conducted in the participants' households. The interviewers read the questions to the participants and recorded the answers on the questionnaire. The researchers and supervisors spot-checked filled and returned questionnaires. Payoff was provided to the interviewers according to the amount of filled questionnaires. KWAHO office staff coded the returned questionnaires.

4.2.4. Data analysis

First, we checked for the appropriateness of the estate pre-selection. The estates as selected and labelled by the supervisors were assumed to be in a simple order, that is, the socio-economic level should increase with increasing status labels. We employed five indicators to check for this assumption: sex, age (mean age of household members in 2007), education (five ordered categories), income class (seven ordered categories), and the number of rooms available to the household members. For each of these indicators a Pearson correlation was calculated to assess the relation to the estate order. Note, that for binary variables the Pearson correlation is equivalent to the point-biserial correlation, if the binary variable displays a true dichotomy (e.g., Bortz, 2005; Hays, 1994).

Second, water consumption was explored in more detail, and a brief look at the water source was taken. While water source was simply an unordered categorial variable holding the supply, the consumption variable was available in two shapes, viz., a ratio of treated water consumed compared to all water consumed, and a factor that was coded from this ratio. The factor indicated whether one was a pure-untreated, pure-treated, or a mixed drinker. The analysis was performed using contingency tables and Pearson correlations.

Third, we explored the PoUS usage. According to overall-usage counts, seven PoUS were considered to be of interest here, ceramic filters, straw filters, chemical

disinfection (e.g., "WaterGuard"), sand filters, SODIS (Conroy et al., 1996, see also http://www.sodis.ch), boiling, and buying bottled water. Note that buying bottled water is actually no treatment device. However, it is a behaviour shown in order to achieve clean drinking water. Therefore, we considered it as a treatment behaviour and added buying bottled water to the list of PoUS. For each PoUS and each estate, consistency checks were performed and, where applicable, Pearson correlations were calculated.

Fourth, the PoUS usage was linked to the water consumption. We examined whether the number of PoUS known or used, or the use of a particular PoUS provoked a different water consumption pattern among participants. Contingency tables and Pearson correlations were used for this part of the analysis.

Then, we asked for a link between simply knowing any PoUS versus using it and the psychological factors introduced earlier in this section. Here, a binary logistic regression model was constructed to find and describe relations of relevant variables to the fact of being a knower-only, or a user of a PoUS. From an initial model holding all PoUS-unspecific variables, a base model was found by means of a stepwise backward search according to the AIC (see Venables & Ripley, 2002, p. 175). Based upon the solution of this algorithm, the coefficients were bootstrapped with 999 repetitions. Finally, non-significant or irrelevant coefficients or those with high collinearity (GVIF, see Fox & Monette, 1992) were removed, and the bootstrap was repeated with the reduced model. Fit measures were calculated, and the usefulness of the model was examined using the predicted-observed table for the outcome variable. A χ^2-test of independence for this table was calculated. All analyses were calculated in interaction with the estate's levels.

Last, we wanted to distinguish between users of the three most prominent PoUS. Here, a target variable held the information of whether a participant is either a user of the first, the second, or the third PoUS. Note that it was not of interest which other PoUS was used by the user or how many PoUS the participant knew. Psychological variables were then linked to the target, including all variables not used in the previous model, and all the PoUS-specific variables. The relation between the variables and the target was explored using a multinomial logistic regression. Like in the previous analysis, a base model was set up including all predictors in interaction with the estate. A backward search based on the AIC then revealed relevant predictors. The resulting model's coefficients were then recalculated in a bootstrap loop with 999 repetitions. After deselecting another set of insignificant

Table 4.2.: Estate check between socio-demographic indicators and the estates order. Displayed are Pearson correlations and 95 % confidence intervals between demographic variables and the estates order.

Indicator	DF	r^*	CI_{low}	CI_{high}
Sex	535	−0.23	−0.30	−0.14
Age	532	0.30	0.23	0.38
Education	522	0.65	0.59	0.69
Income	529	0.75	0.71	0.78
N. Rooms	532	0.76	0.72	0.80

or irrelevant variables (with very small coefficients), a final model was achieved. Pseudo determination coefficients were calculated and the predicted-observed table was produced and checked using a χ^2-test of independence.

Note, that in either of the analyses, some cases were excluded because they contained missing values on one or another variable under consideration. All data analysis was performed using $\mathcal{R}$ (version 2.13, R Development Core Team, 2011).

4.3. Results

4.3.1. Estate check

The estate check was considered necessary to prove the pre-defined label assignment to the estates. These labels were assigned to the estates by visual inspection, but they should accord to a given set of demographic variables. The estate check was done using five variables. The variables, their Pearson correlations with the estate order and some statistics are displayed in table 4.2.

Sex was coded with two numeric values, one and two, where two indicates a person being female. The Pearson correlation between sex and estate is negative, thus, there was more female interviewees in the lower estates. However, the coefficient is only small (for effect size labelling see Cohen, 1988). Referring to table 4.1 (see page 63 above), the age grew with higher estates, and a medium positive correlation coefficient proves this finding. Correlations for level of education, income,

and number of rooms are much higher, and the width of their confidence intervals shrink, signifying that the latter three variables are much stronger indices for the socio-economic class expressed by the estates' labels.

In sum, we can confirm the appropriateness of the pre-labelling. More male and older participants in the higher-class estates, as well as a higher education, more income, and more rooms per home display socio-economic differences very well. The estate's level proves to be a good single indicator of various demographic variables.

4.3.2. Water consumption

Most of the participants from lower-class estates got their water from a public supply, either a municipal public tap or other available public sources. The municipal provider remained in use in the middle class estates, but here persons fetched their water from a private tap. In the upper class estates, private taps from the public provider were still used, but private boreholes (in Karen), private providers, and the use of bottled water as the predominant water source became more prominent.

The percentage of treated-only water drinkers is high in Kibera (about 70 %), the ratio drops in Makongeni to about one half, and then gains about 85 % of the residents in either of the four upper class estates. In sum, three in four participants drank treated water only. However, almost 20 % were untreated-only water drinkers, and 18 participants (3.4 %) said that they drink mixed water, that is, both, untreated and treated water. Frequencies are displayed in table 4.3.

The overall mean consumption was about one litre per person per day. The consumption mean drops among the treated-only and untreated-only drinkers to about 0.9 litres per person per day.

The ratio of treated water drunk was lower in Kibera compared to the upper four estates, but even lower was the ratio in Makongeni. In the four higher-class estates the ratio crossed 80 %, with 90.1 % in Hazina being the highest. The Pearson correlation between estate and the ratio revealed a coefficient of $r^*(535) = .24$, $CI(.15; .31)$, but effectively the coefficient is borne by the cut between the first two and the latter four estates.

Table 4.3.: Consumption of untreated, mixed, and treated water per estate in per cent.

	N	%	Kibera	Makongeni	Buru Buru	Hazina	Karen	Runda
Untreated	103	19.2	28.9	47.7	8.7	7.8	14.5	7.8
Mix	18	3.4	2.1	1.2	4.3	4.9	1.2	6.5
Treated	416	77.5	69.1	51.2	87.0	87.3	84.3	85.7
All	537	100.0	97.0	86.0	92.0	102.0	83.0	77.0

4.3.3. PoUS usage

Across all estates, using a PoUS was very popular. 434 persons (81 %) in the sample had at least one PoUS in use, 100 persons (18.5 %) did not use any PoUS but knew at least one, leaving three participants that had no idea of any PoUS (see table 4.4). The lowest usage rate was found in Makongeni, the second lowest estate, where only half of the residents responded to use a PoUS and the other half only knowing one. In Kibera, which was the lowest class estate, almost three in four participants used a PoUS, and in the four upper class estates almost nine in ten persons used a PoUS.

There was no significant relation between the number of PoUS known and the estate. However, the correlation between the number of PoUS used and the estate showed a Pearson coefficient of $r^*(535) = .28, CI(.20; .36)$ meaning that in the higher-class estates generally more PoUS are applied.

The popularity of a particular PoUS is displayed in table 4.5. The most well-known and well-used PoUS were chemical disinfection, boiling, and buying bottled water, with boiling having been the most applied or used PoUS across all estates. However, the usage varied across estates. Ceramic filters were only known in the higher-class estates. Especially in Kibera, SODIS was very well-known. Concerning the usage – just like knowing – chemical disinfection, boiling, and buying bottles were very predominant. Ceramic filters were in use by about ten per cent of the respondents. Almost only in Kibera, SODIS was used by about one fourth of the respondents.

4.3.4. PoUS usage and water consumption

The data set contained three persons that do not know a PoUS and 100 persons that know a PoUS but do not use one. All of these 103 persons drank untreated water exclusively. Of the users of any PoUS, 18 drank mixed water, and the vast majority of 416 participants were users and drank only treated water. We may emphasise that the former 103 persons did not use any PoUS. As a consequence, exploring the link between non-users (and the three non-knowers) and any index of consumption becomes nonsense: there cannot be said much about these participants, except that they do not drink a tiny drop of treated water.

As said above, 18 users were mixed drinkers. According to attributes' descriptives for those users, a typical mixed drinker used one PoUS and knew a second one, lived in a higher-class estate, was female, had a university degree, was employed,

Table 4.4.: PoUS usage across estates. The upper part displays the knowledge, usage is in the lower part. Shown is the ratio of persons that know/use a PoUS, and how many PoUS they know/use together with statistics. *Knowers do not include users!*

Estate	N	%	M	SD	Min	Max
			Know			
Kibera	97	27.8	1.4	0.7	0	3
Makongeni	86	47.7	1.2	0.6	0	3
Buru Buru	92	8.7	1.1	0.6	0	3
Hazina	102	6.9	1.1	0.6	0	3
Karen	83	13.3	1.4	0.7	0	3
Runda	77	7.8	1.4	0.8	0	3
All	100	18.6	1.3	0.7	0	3
			Use			
Kibera	97	71.1	0.8	0.6	0	2
Makongeni	86	52.3	0.6	0.6	0	2
Buru Buru	92	91.3	1.0	0.4	0	2
Hazina	102	92.2	1.1	0.5	0	2
Karen	83	85.5	1.0	0.6	0	3
Runda	77	92.2	1.2	0.7	0	3
All	434	80.8	0.9	0.6	0	3

Table 4.5.: PoUS popularity across estates (N per estate in brackets). The upper half displays knowing a PoUS, usage is in the lower half. Shown is the number of persons. Note that knowers do not include users. Note also that the frequencies cannot add up to the marginals because of multiple knowing/using.

PoUS	Kibera (97)	Makongeni (86)	Buru Buru (92)	Hazina (102)	Karen (83)	Runda (77)	Total (537)
			Know				
ceramic	0	2	4	6	12	14	38
straw	1	1	4	4	4	6	20
chemical	54	47	60	67	44	39	311
sand	0	0	2	5	4	5	16
SODIS	19	0	0	0	0	1	20
boiling	51	45	23	21	35	34	209
bottles	8	12	11	14	14	7	66
All	27	41	8	7	11	6	100
			Use				
ceramic	0	0	2	1	5	4	12
straw	0	0	1	0	1	2	4
chemical	16	18	14	13	15	5	81
sand	0	0	1	2	0	2	5
SODIS	24	0	0	0	0	0	24
boiling	36	29	56	64	31	25	241
bottles	0	1	17	29	31	53	131
All	69	45	84	94	71	71	434

earned more than 100,000 Ksh per month, and obtained water from the municipal provider using a private tap.

To summarise, firstly, there cannot be much said about the step from being a non-knower to becoming a knower. Secondly, 18 mixed drinkers were too few to find relationships between knowing or using one or the other PoUS, and their water consumption. For the remaining participants, a perfect fit could be found: if one used a PoUS (any PoUS) he or she drank treated water exclusively, no matter how many PoUS were applied. If not, they were exclusively-untreated water drinkers and knowers-only. In turn that means, knowing more PoUS does not affect the treated-water consumed, neither does the number of PoUS used. Instead, if one switches from a knower-only to a user, his or her consumed water should shift completely from untreated water to treated water.

4.3.5. Psychological factors for knowing versus using a PoUS

So far, we have discussed that PoUS usage relates to the treated water consumption in that any PoUS usage leads to drinking exclusively treated water. Thus we asked what psychological factors distinguish between knowers versus users of a PoUS. Note that here we did not ask for particular PoUS. Therefore, PoUS-specific variables were excluded. Moreover, single demographic variables were excluded from this analysis as well: the interest was directed towards variables that could be subject to interventions. Shifting a person from a lower-class to a higher-class estate or changing the sex of participants could obviously not be achieved through human effort. However, in section 4.3.1 we have shown that emphestate is a good cumulative indicator of various demographics. To check for variations in impact of psychological variables due to different socio-economic backgrounds, the estate was included as an interaction term.

A binary logistic regression distinguished knowers from users. Nine variables were found to contribute to this distinction (see table 4.6). The most important regressor was the frequency of communication ("number of household members and times suffered from an illness due to contaminated water"). The addend shows a negative coefficient indicating that more members or times were related to less use. In other words, non-users (knower-only persons) were more affected by illnesses than users. Other addends also contributed to the equation with a negative coefficient, among them the number of hours where water is continuously available, and the interaction between anxiety about illnesses and the estate.

Table 4.6.: Binary logistic regression of various psychological regressors on using or only knowing PoUS. Displayed are factor groups, labels, log odds coefficients and their confidence intervals, and e^B of the addends. Addends include interaction terms with estate. All regressors have values between $(0; 100)$. (See table C.2 in appendix C for a description of the variables.)

Concept	Shortlabel	Coef.	CI_{low}	CI_{high}	e^B
Constant		−13.759	−20.968	−9.234	0
Vulnerability	drink treated makes healthier	0.018	0.004	0.034	1.018
Instrumental belief	costs worth treat	0.050	0.029	0.079	1.052
Affective belief	good to treat	0.035	0.014	0.061	1.036
Injunctive norm	treat is good for image	0.055	0.014	0.123	1.056
Frequency of communication	number and times suffer	−0.134	−0.351	−0.041	0.874
→ *Interaction with estate*		0.001	−0.002	0.005	1.001
Controllability	water hours available	−0.033	−0.062	−0.011	0.967
→ *Interaction with estate*		0.001	0.000	0.001	1.001
Emotion	anxiety	0.036	0.012	0.066	1.036
→ *Interaction with estate*		−0.001	−0.001	−0.000	0.999
Emotion	compulsion	0.029	0.016	0.046	1.030
Emotion	sympathy	0.036	0.024	0.053	1.037

$R^2_{CS} = .458$, $CI_{95}(0.395; 0.523)$; $R^2_N = .761$, $CI_{95}(.674; .845)$; $\chi^2(1) = 48.83$, $p < .001$.

However, the main effect of anxiety was positive, which means that more anxious persons are more likely to be users. Other regressors, such as costs-benefit considerations, beliefs that treating is a good thing that makes one healthier, and valuing treating to have a good image, also positively affected the decision to be a user.

A main effect for estate (as an indicator of various demographic items) was not found. Interestingly, all interactions with estate slightly reverse the main effect of the regressor: the frequency of communication slides from -0.134 to 0.001, controllability from -0.033 to 0.001, and the coefficient of anxiety drops 0.036 down to -0.001. However, the interactions with estate had very small impacts, with two of them being not significant.

Two pseudo R^2s were calculated: The Cox-and-Snell-R^2 had a medium value of $R^2_{CS} = .46$, $CI(.39; .53)$, while the Nagelkerke-R^2 valued much higher at $R^2_N = .76$, $CI(.67; .84)$. However, since all pseudo R^2s rest upon the log-likelihood ratios of the resulting models – and thus, rest upon an almost arbitrarily given value (see Long, 1997; Winsemius, 2011, personal communication) – our measure of usability of the model was the predicted-observed table. The model performed quite well when it came to prediction. Of the 501 cases in this analysis, 468 (93 %) could be predicted correctly, leaving 20 false positive and 13 false negative predictions. The χ^2-index of the contingency table was significant with $\chi^2(1) = 286.9$, $p < .001$ (see table 4.6 for details).

So far, this part of the analysis included cases of knowers versus users, regardless of the number of PoUS known or used. A second question was addressed asking for the model's usefulness when it comes to the distinction between users that knew only one or used only one PoUS. 80 participants were identified being either a one-knower only, or a one-user only. The model formula was applied to those cases, and it revealed a very good prediction. Four predictions were wrong, where 75 cases were correctly identified. The χ^2-index for this table was $\chi^2(1) = 48.82$, $p < .001$.

4.3.6. Using the one or the other PoUS

In the previous sections we have explored links between demographics and consumption, between demographics and the PoUS usage, and the influence of PoUS usage on consumption, as well as the influence of various psychological factors on being a user or a knower of PoUS. In this section, the analysis focused on users of three prominent PoUS, boiling (199 participants), buying bottled water (99 participants), or chemical disinfection (57 participants). Here, we asked for psychological reasons

that distinguish between being a user of either of these PoUS. Note that it was not considered how many other PoUS one uses, nor was it of interest how many PoUS one knows. Moreover, we made no distinction whether any decision towards use could perhaps be based on knowing one or two of the other PoUS under study here.

The set of regressors was assembled from the PoUS-unspecific variables that were not used in the previous analysis, and all PoUS-specific variables. Since the dependent variable held whether one uses either of the three selected PoUS, PoUS-specific variables could have been merged into a single regressor. All regressors were examined in interaction with the estate. The model was constructed using multinomial logistic regression. The results are displayed in table 4.7.

Table 4.7.: Multinomial logistic regression of various psychological factors on using either of the three PoUS, boiling, buying bottled water, or chemical disinfection. Displayed are the factor labels, log odds coefficients and confidence intervals, and the e^B coefficients of the addends. Note, that all regressors were scaled to $(0; 100)$. Boiling is the baseline, thus, a coefficient reads: "Given one boils water, how does the regressor affect the switch to either of the other two alternatives?" (See table C.2 in appendix C for a description of the variables.)

Factor	Coef.	CI_{low}	CI_{high}	e^B
buying bottles				
Constant	−0.059	−0.153	0.026	0.943
PoUS is cheap (Instrumental belief)	0.003	−0.025	0.033	1.003
→ *Interaction with estate*	−0.014	−0.053	0.025	0.986
P. enhances odour (Instrumental belief)	0.051	0.016	0.094	1.052
→ *Interaction with estate*	−0.056	−0.108	−0.006	0.946
Talking abt. P. is good (Affective belief)	−0.098	−0.180	−0.012	0.907
→ *Interaction with estate*	0.116	−0.024	0.237	1.123
Responsible for health (Controllability)	0.085	0.022	0.164	1.089
→ *Interaction with estate*	−0.097	−0.200	−0.012	0.907
Estate	0.074	−0.051	0.223	1.077

Table 4.7.: Multinomial logistic regression of various psychological factors on using either of the three PoUS... (continued).

Factor	Coef.	CI_{low}	CI_{high}	e^B
chemical disinfection				
Constant	−0.032	−0.118	0.051	0.969
PoUS is cheap (Instrumental belief)	0.062	0.028	0.125	1.064
→ *Interaction with estate*	0.047	−0.063	0.158	1.048
P. enhances odour (Instrumental belief)	0.008	−0.020	0.037	1.008
→ *Interaction with estate*	0.027	−0.036	0.100	1.027
Talking abt. P. is good (Affective Belief)	−0.025	−0.138	0.069	0.975
→ *Interaction with estate*	0.063	−0.130	0.316	1.065
Responsible for health (Controllability)	0.002	−0.039	0.053	1.002
→ *Interaction with estate*	0.027	−0.065	0.141	1.028
Estate	−0.171	−0.386	0.005	0.843

$R^2_{CS} = .554$, $CI_{95}(.478; .639)$; $R^2_N = .474$, $CI_{95}(.405; .551)$

$R^2_{McFadden} = .333$, $CI_{95}(.273; .404)$; $\chi^2(4) = 156.25, p < .001$

The model distinguishes moderately between either of the users. About two thirds of the users were correctly identified (241 of 348): best predictions were achieved for the boilers (baseline). Medium-sized pseudo R^2s were revealed, and the χ^2-index for the prediction table was $\chi^2(4) = 40.3$, $p < .001$ – however, the significance is effectively based upon the large sample size (e.g., Cohen, 1990, 1994) and could hardly be an indicator of good prediction here. In fact, with the exception of the item "PoUS is cheap", no significant regressor was found for chemical disinfection. Yet, the significant regressor reads that chemical "disinfectors" rate their PoUS cheaper compared to bottle-buyers, and even cheaper than boilers.

Aspects of cheapness seem to play no role for buying bottles. The coefficient is rather small and not significant here. Yet, two main effects and two interactions were found to be significant for this alternative. Buying bottles seems to be the choice if persons value the odour-enhancing aspect of this PoUS. Experienced responsibility

for health positively influences the choice for bottles; yet, the effect reverses in interaction with the estate. That means, that the positive influence of responsibility is only effective in the lower estates. This conclusion is supported by the missing main effect of the estate regressor. Another interactive influence was found for the item "talking about treatment is good". However, here the interaction is positive, which means that the effect increases with increasing estate.

To sum up, predicting the choice between either alternatives depends on which alternative to predict and which estate the user is a resident of. It may be emphasised that estate alone showed no significant effect, but became slightly more important in the interaction terms. Yet, only about two thirds of the cases were predicted correctly with the use of the present model.

4.4. Discussion

The aim of the present study was to gain knowledge on use or non-use of PoUS in six socio-economically diverse estates in Nairobi, Kenya, and to find evidence for the link between water consumption and the use or non-use of PoUS, and various psychological variables along the estates. In general, the approach proved to be fruitful with a detailed insight into PoUS in use and consumption patterns in several socio-economical environments, as well as useful models between usage of PoUS and various factors. Yet, three aspects of the study are considered worth a closer look, the selection of estates, patterns of consumed water and PoUS usage, and models combining psychological factors such as regressors with the usage as an outcome variable. A detailed look at these three aspects follows.

4.4.1. Estates

The study was conducted in different estates in Nairobi, Kenya, following the goal to sample information from a wide range of socio-economic environments. A general look at the estate check verifies that this goal was achieved.

However, selecting Kibera as a part of the study and assigning it the lowest class label was somewhat biasing, and we may speculate about the underlying causes. Kibera is the most well-known Slum in Africa, perhaps in the world. Many foreigners live there especially if they come from abroad, and the mixture of cultures is scratch. Regarding central tendencies and prototypes among our variables, this fact may blur clear pictures and cause dispersion. Likewise, much research is done in this estate

that connects to the topic covered here (Lamba, 1994), and it is not clear whether this fact biases the data acquired.

As an example, the SODIS technology was spread across Kibera in intervention campaigns (Graf, Meierhofer, Wegelin & Mosler, 2008). Such campaigns usually include knowledge transfer via education about health related issues, water quality, and water treatment. As a result, residents could be better informed compared to, say, residents of Makongeni where no such campaigns took place. Actually, Makongeni, which was the second lowest estate, showed much worse indices along some interesting data, and that supports our speculation that Kibera is not the worst part to live, given that one has to live in a slum.

However, as shown in section 4.3.1, the estate is a good summative indicator for various socio-demographical and economical variables. Indeed, information is lost if particular variables are bundled this way. However, the big advantage of the approach selected here was that an indicator such as the resident's estate is clearly visible, and thus hardly needs interaction between the researcher and the respondent. This way, a non-responsive variable could not be biased by, say, social desirability or other error. In addition, the analyses from above were re-performed with the exclusion of Kibera residents. No regression was seriously altered when applied to this subset, rendering the regression results from above indeed useful.

In general, over all estates, a wide range of data could be acquired. Participants were of differing education levels, income class, and housing conditions, and the estates provided a good basis for a sample composed of many characteristics. Yet, researchers should be *aware* that Kibera could, in principle, differ widely from any expectations about the composition of various variables of interest.

4.4.2. Water-consumption and PoUS-usage patterns

Across all estates, much of the water was obtained from the municipal water supplier, that is, the Nairobi City Water and Sewerage Company, either from public taps or from private in-house installations. A link between the source and a treatment application was not found: even Runda residents apply treatment devices, and they are supplied with water from their own private water company, viz., Runda Waters. Hence, water quality issues, reliability, and drinkability seem to be topics regardless of the estate in Nairobi or the socio-economic attributes of the resident.

As a side effect, we noticed that there is a remarkable number of private boreholes in Karen. It has been discussed whether this could compromise the ground-

water level (e.g., Foster & Tuinhof, 2005). Yet, Karen is a farming area and it is not clear whether alternative supply options exist in all corners of the estate. In our analysis, alternatives existed, and thus, the picture here suggests that future action should be undertaken to reduce the number of private boreholes and demonstrate alternative sustainable water supplies.

The mean consumption of drinking water per day was unexpectedly low. One litre per day in a region where it is usually hot is not much. Yet, our consumption indicator did not include drinking coffee, tea, or soft drinks – all being very popular in Nairobi. Thus, drinking one litre of water per day does not mean drinking one litre of *fluids* per day, and that in turn makes our results appear more plausible. In addition, drinking one of the alternatives just mentioned would mean increasing the treated fluid consumption, which is a gratifying side result of the study.

Concerns about water quality and drinkability seem to spread across all estates, regardless of the water source and the status of the residents. The number of participants who drink exclusively treated water was happily very high, and this finding was reflected by the relatively low number of persons who suffered from illnesses during the last three months (about 24 %) – regardless of the estate. Surprisingly, there is also a remarkable number of persons who drink untreated water only. We may note that municipal water delivered through public pipelines is by no means clean and safe, and some consumers even wash the bottles they bought before drinking. We speculate that surveying illnesses may cause shame and that respondents give adjusted answers rather than true frequencies (e.g., Krosnick, 1999), making our data slightly biased in one or the other way in this concern.

Especially in Makongeni, drinking treated water only is not as popular as in the other estates, and in Kibera a still remarkable proportion of residents drink untreated water. The persistent non-treatment rate can be due to the high fluctuation in residents there, where new migrants have not participated in an intervention campaign already. And indeed, when comparing Makongeni and Kibera it seems that intervention campaigns on water treatment work well, but still with potential for increase. However, according to our findings, Makongeni is an important estate that actually needs intervention but has been left off spot, so far. Just like observed above, it can be questioned whether Kibera is the place with *highest* demand on action and whether it is the most promising place to gain insight into processes of health improvement in scientific studies.

The high ratio of treatment-only drinkers is also confirmed by the high usage

ratio of PoUS in our study. SODIS was almost only known (and used) in Kibera, where intervention campaigns on diffusion of this technology have taken place in recent years. However, the ratio of SODIS users still leaves much room for reinforcement. In the upper class estates, bottled water contributed dominantly to the treated water consumption.

Across all estates, boiling and chemical disinfection were the most prominent PoUS. Yet, to be effective, boiling requires specific temperatures, but Nairobi has an altitude of 1,795 metres above sea level, which results in a lower boiling point. From our study, it is unknown whether this fact is considered among users of boiling. Likewise, chemical filters (e.g., "WaterGuard") require a regular replacement of the filter unit. If these issues go unconsidered by users, they may apply a treatment, which is eventually totally ineffective.

As outlined in section 4.3.4 (page 71) above, our study could not reveal insight into the process from being a non-knower, knower, or user of a PoUS and the treated water consumed. Likewise, no relation could be revealed between the number of PoUS known or used, and the consumption ratio. However, this result is promising, because it means: using a PoUS – any PoUS, any number of PoUS – seem to result directly in exclusively treated-water consumption. Hence, neither knowing *more* nor using *more* (than one) PoUS can increase the treated water drunk. That means, shifting a person from non-user to user of *any* PoUS will result in a totally-treated-water drinker. That in turn means, that campaigns tailored to a specific PoUS could be altered to introduce *any* PoUS, as long as persons are brought to be PoUS users, eventually.

4.4.3. Psychological factors and PoUS usage

Various psychological factors popped up with a link to the usage of PoUS. The most prominent contributor was the factor holding the number of household members and number of times suffered from an illness. Apparently, there is a strong link between the consumption of untreated water and infections.

The factor of cost-benefit evaluations was a second one for applying a PoUS. This finding suggests the promotion of devices that are cheap and efficient. Throughout this article it has been emphasised that SODIS is such a PoUS. However, SODIS was in use in Kibera only, and it can be questioned whether residents of, say, Karen, would expose PET bottles to the sun on an open place. The social-image enhancing factor of treating had an even so high positive influence on using a PoUS but it

can be questioned whether residents of higher-class estates find it image-enhancing if they apply SODIS with PET bottles. Moreover, from this point of view, SODIS seems unusable for residents of rental flats without an open place to expose the bottles.

The assumption receives support given the influence of the factor of affective beliefs, that is whether it is good to treat or not. The question item behind the factor did not distinguish between "treat in general" or "treat with the PoUS you use". Hence, in principle, residents of Hazina (upper middle class) could find it "good to treat" with chemical disinfection, but *not* "good to treat" with SODIS. As a consequence, the promotion of SODIS there would eventually go effectless.

Emotional factors seem to play a role in the decision process among the participants. Anxiety is one driver towards the use of PoUS. However, in terms of intervention it is debatable how such a factor can be utilised.

Our analysis of factors that can distinguish between the users of one PoUS or the other does not solve the issue either. In interaction with estate, the regressors' weights reverse. Hence, we may conclude that factors such as cost-benefit considerations or odour enhancement are not *per se* key factors but are effective only in interdependence with the socio-economic class. However, the explanatory power of the distinction model is moderate, and a remarkably high proportion of users go unrecognised by the model's predictions.

Like stated above, good sense would strongly suggest that using SODIS or a ceramic filter does indeed depend on some cognitive processes such as the recognition of acceptance among neighbours, feelings of status, indeed effort and outcome, too. However, the approach presented here was apparently not fully beneficial to clarify the factorial situation. We may speculate about influences causing this blur. Difficulties could have arisen from the length of the interviews and language barriers. Many of the residents of the higher-class estates are busy, and even in Runda where the interviews were conducted at weekends, participants may have felt annoyed of being kept of their spare time for about one hour. Hence, the quality of the answers recorded could be decreased. Likewise, especially in Kibera, interviewers were required to translate the English questionnaire into various local languages on the fly. It is unclear whether the translation was correct. From this point of view, a remarkably shorter questionnaire in English, Swahili, and Nubian would perhaps facilitate higher data quality. However, the goal here was to explore mostly unclear factors of PoUS usage, and therefore a broad range of possible questions was to be

covered.

Usually, model estimation towards the use or non-use of a technology includes demographic variables in the regressors list. We used estate as a quick-and-dirty summative indicator of socio-demographic attributes. Nevertheless, we want to emphasise that demographic attributes cannot be subject to interventions. Of course, a technologically sophisticated device such as an, say, "iPod", would usually be bound to younger persons, rather than pensioners. Performing an analysis of influencing factors would – indeed – reveal age as the one relevant factor with the highest impact. But what could we learn from such a model? The only thing we could learn is to regretfully state that this is the way it is and that there is no chance to change the state of affairs, since there is no chance to make pensioners younger. However, while estate alone did not pop up as an influential regressor and was non-influential as an interaction term for the distinction between users and non-users, factors influencing the decision between the one PoUS or another may depend on the estate where such a PoUS is to applied. Hence, although estate is not alterable, interventions targeting psychological factors should consider differences depending on the socio-economic background of the target population.

While we have just stated that the application of technological devices depends on socio-demographic variables, recent years have shown to define the strong distinction down (e.g., Lam & Lee, 2005). Pensioners start using computer technology, with different education programmes, slight modifications among the devices, and so forth. All these "interventions" aimed at psychological factors, knowledge transfer, reducing anxiety barriers, and many more. What is true for computer technology is not more wrong for any technological device, hence, treatment devices. Knowing that females treat more than males would not help to do anything. Knowing that high knowledge relates to females where low knowledge relates to males tells a totally different story and initially invokes the idea of knowledge transfer. Again, the conclusion from these considerations is to promote cost-effective PoUS, especially among those residents where the usage rate is rather bad, i.e., Makongeni.

4.5. Conclusions

We investigated PoUS usage patterns and psychological factors in the socio-economically diverse town of Nairobi, Kenya. Our approach should display the current state of affairs, unveil differences between various residence classes, and ar-

gue the recurring statement that "the backgrounds of PoUS usage are not known." Our findings display good treatment practices among the residents under study, yet, with more potential in some cases. Our findings display also that effort and benefit are crucial aspects of usage, regardless of a particular PoUS. Further research should focus on factors that help to distinguish between users of one or the other PoUS, and consequently, which factors are relevant for the promotion of particular PoUS. Because our attempt does not allow for causal interpretation, scientific intervention campaigns can be established if the focus is not limited to Kibera only. We want to highlight again, that Makongeni was the estate with the worst PoUS usage, and that the problem of the increasing number of private boreholes in Karen (Foster & Tuinhof, 2005) may cause serious future problems.

5. Integrative conclusion

The present thesis aimed at demonstrating insights into three different fields of water usage. First, consumption patterns and motives for water consumption among Swiss customers were investigated. Switzerland has high-quality tap water, and in general, much effort is spent from the supplier's side to provide a premium-class product. Yet, customers buy bottled water, a consumption behaviour that is seen as ecologically critical: bottled water has no higher quality but instead, plastic bottles cause litter, and transport of bottled water causes pollution and waste of fuel. Moreover, buying bottled requires travel to a super market, carrying bottles home, storage of bottles, cooling of the water, and recycling of the empty bottles – where tap water is simply already there at a price 1,000 times lower than bottled water. From this point of view, choosing bottles over tap is a peculiar observation. Little is known about the consumer's decision. The work presented here contributed to this interest and delivered insights into relations between psychological factors and the consumers choice. I emphasised that the choice between tap and bottled water is influenced by the preference for carbonation, emotional components such as anger, and normative influences of persons in the social environment.

One important outcome of this study was that tap water is very popular, and that interventions from the suppliers' side are not needed today. Yet, business data suggests that the tap water market is continuously increasing. If, eventually, such interventions are seen to be necessary, the factors revealed in the study can be very useful, since they provide grid points of action.

In view of the previous deliberations, a second user behaviour becomes salient. If tap water is a high-quality ready-to-go product in Switzerland, why do users apply treatment devices to that water? I was able to identify two distinct classes of such treatments, hard-treatments and soft-treatments, and I have pointed out that for the first class, scientific reasoning verifies the efficacy where for the latter it does not. The most prominent hard-treatment was some limestone-removing device, either as a mobile filter or as a fixed in-house installation. Soda is a hard-treatment as well, and to some extent this is also used among the Swiss customers.

Yet, a specific subset of the respondents also used soft-treatments (e.g., Grander), and although the variable-profiles between users of various treatments showed some interesting differences, the sample was generally too small to assess these differences with statistical significance. In sum, knowledge and satisfaction concerning either water type (tap versus bottle) and treatments seem to play a role, but the role is too tenuous to provide a veritable basis. Yet, especially in the field of soft treatments, further research could pick up the results found here to start extended research among these users, because cases of soft-treatment applications are not limited to private households. I have emphasised that this may waste public funds and cause serious health problems if hard-treatments are replaced by soft-treatments.

According to the data analysed here, using a treatment device in Switzerland was by no means reasoned with health concerns. Yet, such health concerns popped up in the third aspect of water usage assessed here, that is, the PoUS-usage and water-consumption patterns among residents of Nairobi, Kenya. Experiencing a threat from not treating water, was present along all participants in this study. As a consequence, many users drink already treated water exclusively, and the application of a treatment device can be found across many of the participants in the study, regardless of the socio-economic background or housing conditions. In contrast to the findings in Switzerland, knowledge played no role at all. Instead, important factors that suited to distinguish between users and non-users were cost-benefit aspects and feelings of responsibility and doing the right thing. In sum, the current state of affairs is good, but there is room for more intervention, and Makongeni was identified as the estate that requires intervention most pressingly. If such interventions are planned, they should hardly be based upon knowledge transfer but on intrusion of emotions of responsibility and that the cost of treating is worth the outcome. Also, PoUS should be designed that enhance odour, at least as a by-product, because odour has been suggested to be an quick-and-dirty indicator of dangerous water quality (McGuire, 1995). Moreover, interveners could think about utilising fear of illnesses, but this has to be done very carefully for ethical reasons. It is a helpful finding that the actual PoUS that the end user applies plays no role, that is, *any* PoUS would shift an untreated-water drinker to a treated-water drinker.

Generally, the present research results provide a solid knowledge base of the issues covered here. This knowledge base can be taken as a starting point for further research. Yet, the attempts undertaken here are not perfect or complete. I want to pick up some aspects that could be enhanced.

I applied several factors from various psychological theories. The procedure proved to be convenient and fruitful. I can clearly recommend that further research could apply the approach chosen here, especially if the research targets description, exploration, and detection. However, some factors may have been missing. Again, I may emphasise that – although being an implicitness in Switzerland or healthily motivated in Nairobi – consuming water, buying bottles, or applying a treatment method or device can reasonably be seen as a consumption behaviour. In the course of this thesis I have accentuated the importance of advertisement, marketing, or media – or, to put it exaggeratedly, perhaps buying a bottle of water or a treatment device is not different from buying an iPod. Of course, there is no proof for my hypothesis, but the point is that evidence could be found. Crook et al. (2009) for instance provide an interesting idea how bottled water became such a commercial success. Research on that topic would probably require a deeper analysis of media reports with simultaneously checking consumer data and opinions. From my point of view, especially in Switzerland this could be the most fruitful follow-up action to enrich the knowledge presented here. However, consumption aspects of this shade were not regarded in the course of this thesis.

By the end of this research project, especially in response to public outlines on the findings in Switzerland, many persons wrote informal letters. The contents express more ideas about how the decision to apply a treatment or to buy bottled water is formed. In-house installations, for instance, may be old and it would be not under the control of the tenant to renew them – circumstances which may force persons to apply cleaning methods to the tap water. Others have noted that a consumption situation such as at work cannot be compared to a consumption situation such as at home because of the totally different setting and opportunities to perform an intentional behaviour. In my opinion, altering follow-up research on this topic to cover these suggestions would enhance the knowledge on user behaviour in Switzerland.

Cognitive contradictions were reduced to a resulting emotional feeling. However, literature suggests that invoking these processes could indeed change user behaviour – hence, can be seen as an important factor. Thus, focusing on the process of inducing cognitive contradictions could clarify the picture of how contradictions influence consumption decisions in the cases examined here. Such an approach could start with smaller experiments, then be expanded to medium range interventions and finally be framed with longitudinal surveys. However, conducting such a research

process would require much time, many resources, and, in the first place, much more compliance on the participants' side. From personal notes, I can conclude that conducting survey research in Switzerland is very difficult, since residents here are usually overwhelmed with surveys. Yet, the results presented here could provide a good basis for planning such a research project, and it could perhaps help to prevent some difficulties that would probably arise for the inexperienced.

Also, some of the methodological attempts made here were unfruitful. Distinguishing between users of either device or finding causal relations between constructs under study did not deliver solid evidence. Current psychological research employs sophisticated statistical tools such as structural equation modelling (SEM). I avoided stepping into this field. Questionnaire research still delivers the researcher with rather rough numerics, and the numerics are a result of some measurement process *limited* to a cognitive process of the person asked, not the researcher's attempts. A procedure applied that way can hardly be called measurement as we usually do when measuring, say, length (e.g., Krantz, Suppes, Luce & Tversky, 1971; Michell, 1986; Michell, 1990).

However, from a point of view where respondents apply some kind of measurement process and supply the result via marking crosses on a questionnaire, the researcher may assume that the resulting numerics display some simple order of a manifestation of a particular concept (Robert Tobias[1], 2008, personal communication). Since a numeric is simply a numeric and the permissible statistics doctrine introduced by Stevens (1946; 1951) has proved to be invalid, I gained some justification to apply statistical tools such as regression analyses. Yet, it was to be noted that even linear regression on bounded variables is somewhat critical (e.g., Field, 2005). The estimation process is based upon continuous measures, not on some 7-level positive integer codes. Hence, such statistical tools are very sensitive to rough data that usually comes with questionnaire research, and simple variations or violations resulting from the rough coding procedure render the result unusable, regardless of whether the routine actually produced a result. Structural equations potentially extrapolate these difficulties, and the danger of making wrong results even worse just because of already-wrong intermediate results, is exponentiated. Hence, I assume such results to be, at best, useless.

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Instead, much of the power of simple linear models (such as generalised linear models) still goes unrecognised by researchers in the social-scientific realm, e.g., psychology. Usually, research in these fields draws a sample, calculates some model, and then: takes the work on file. To date, I do not know a single work that estimated a model with the purpose to use it for prediction among new data sets. In this thesis, I tried to show an application of establishing models and then use them for new data. I was able to show that this could provide some interesting results, and I would emphasise the promotion of model reuse, testing, and refinement, rather than one-way one-shot modelling. Such an approach, however, requires indeed a deeper understanding of the dimensional structure of the factor groups employed here and the structure of the derived items.

In sum, much of the research presented here can be extended. Addressing causal relations between factors and outcomes, or using models to assess predictive power of regression equations are two extensions to be highlighted. Moreover, taking the identified relevant factors into new research, say, on the application of soft treatments appears to be a promising follow-up. Yet, for various reasons that I have mentioned through the course of this thesis, conducting such attempts from scratch appears to be impossible and dangerous. Thus, the results here provide a good insight into the current state of affairs, it suggests links between psychological factors and consumption, and it can be taken as starting point for future research in the field where researchers want to know more about psychological backgrounds of drinking tap water or drinking bottled water or using treatment devices.

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Author Index

A. Questionnaire: “Der Trinkwasserkonsum der deutschsprachigen Schweizer Bevölkerung”

Fragebogen

Der Trinkwasserkonsum der deutschsprachigen Schweizer Bevölkerung

eawag
aquatic research

Eawag: Das Wasserforschungs-Institut des ETH-Bereichs

Seite 2

Sehr geehrte Dame, sehr geehrter Herr,

vielen Dank, dass Sie an dieser Befragung teilnehmen. Bevor Sie den Fragebogen ausfüllen, lesen Sie bitte **zuerst** diese kurze Anleitung!

Im Fragebogen geht es um das Trinken von Trinkwasser als **Erfrischungsgetränk** in der **deutschsprachigen Schweiz**. Mit „Trinkwasser“ meinen wir dabei:

(1) Leitungswasser: Wasser vom Hahn oder vom Brunnen

(2) Flaschenwasser: vom Supermarkt, im Restaurant, vom Kiosk etc.

Achtung: Heissgetränke (z.B. Tee, Kaffee), Softdrinks (z.B. Eistee, Cola, Rivella) oder andere Getränke (z.B. Wein, Bier) sollen **nicht zum Trinkwasser zählen** – um diese Getränke geht es hier **nicht**!

Bitte beantworten Sie die Fragen der Reihe nach und berichten Sie nur über Ihre persönlichen Erfahrungen und Meinungen. Bitte antworten Sie zügig und ohne langes Überlegen. Beantworten Sie bitte **jede** Frage, und versuchen Sie die Antwort zu finden, die für Sie am ehesten zutrifft – es gibt keine richtigen und falschen Antworten! Bei offenen Fragen notieren Sie Ihre Antwort bitte in Druckbuchstaben für gute Lesbarkeit.

Kennzeichnen Sie Ihre Antwort mit einem **deutlichen Kreuz**. Benutzen Sie dafür einen **blauen oder schwarzen Kugelschreiber**. Achten Sie darauf, dass Ihre Kreuze nicht in andere Antworten hineinragen oder durch das Papier durchdrucken, denn die Fragebögen werden maschinell eingelesen. Markieren Sie die Antworten wie folgt:

Haben Sie versehentlich eine Antwort angekreuzt, ...:	○	⊗	○
können Sie diese zur Korrektur umkreisen .....:	○	(⊗)	○
und danach eine andere Antwort ankreuzen. .....:	⊗	(⊗)	○

Die Ziffern am Rand dienen lediglich der Auswertung und können ignoriert werden. Der Einfachheit halber verwendet der Fragebogen die männliche Form, die weibliche gilt gleichermassen. Das Ausfüllen des Fragebogens nimmt etwa 15 Minuten in Anspruch.

Vertraulichkeit: Ihre Angaben werden selbstverständlich vertraulich behandelt.

Herzlichen Dank für Ihre Unterstützung und Mühe!

➡ **Zu Beginn** möchten wir gerne etwas über Ihre Bewertung von Wasser erfahren.

In welcher Gegend wohnen Sie? [100]

◯ Stadtgebiet

◯ Agglomeration/Vorstadt/Stadtrand

◯ Ländliche Gegend

Haben Sie (nach Ihrer Einschätzung) längere Zeit in einem Land gelebt, in welchem das Leitungswasser ungeniessbar war?

◯ Nein ◯ Ja [101]

Ihr Leitungswasser zu Hause ist (so viel Sie wissen) zu ...

.....% Quellwasser [102], ...% Grundwasser [103], ...% Seewasser [104].

◯ Weiss nicht. [105]

Wie viel Interesse haben Sie im Allgemeinen an Themen, die mit Leitungs- oder Flaschenwasser zusammenhängen?	*Keins*	*Wenig*	*Normal*	*Grosses*	*Sehr grosses*	
	◯	◯	◯	◯	◯	[106]

Wie viel Liter Flaschenwasser haben Sie (nach Ihrer eigenen Schätzung) in der vergangenen Woche gekauft? Beispiel: Ein Sechserpack im Supermarkt mit 1,5 Liter pro Flasche ergibt zusammen 9 Liter.

.....Liter. [107]

Seite 4

Wie zufrieden sind Sie mit …	Sehr unzufrieden	Unzufrieden	Etwas unzufrieden	Weder noch	Etwas zufrieden	Zufrieden	Sehr zufrieden	
… Leitungswasser?	◯	◯	◯	◯	◯	◯	◯	[108]
… Flaschenwasser?	◯	◯	◯	◯	◯	◯	◯	[109]

Wie billig/teuer finden Sie ganz allgemein …	Sehr teuer	Teuer	Etwas teuer	Weder noch	Etwas billig	Billig	Sehr billig	
… Leitungswasser?	◯	◯	◯	◯	◯	◯	◯	[110]
… Flaschenwasser?	◯	◯	◯	◯	◯	◯	◯	[111]

Wie viel Vertrauen haben Sie, dass jedes der folgenden Wässer einwandfreie Trinkqualität aufweist?	Gar keins	Wenig	Mittel	Viel	Sehr viel	
Leitungswasser	◯	◯	◯	◯	◯	[112]
Flaschenwasser	◯	◯	◯	◯	◯	[113]

Wie oft haben Sie schon negative Erfahrungen mit dem Konsum von …	Nie	Selten	Ab und zu	Oft	Sehr oft	
… Leitungswasser gemacht?	◯	◯	◯	◯	◯	[114]
… Flaschenwasser gemacht?	◯	◯	◯	◯	◯	[115]

Wie viel wissen Sie **ganz allgemein** über . . .	*Gar nichts*	*Wenig*	*Mittel*	*Viel*	*Sehr viel*	
. . . Leitungswasser?	◯	◯	◯	◯	◯	[116]
. . . Flaschenwasser?	◯	◯	◯	◯	◯	[117]

Wenn Sie sich für **eine** Wassersorte entscheiden **müssten**, welches Wasser würden Sie bevorzugen? (Bitte nur **eine** Alternative ankreuzen!) [118]

◯ Leitungswasser **ohne** Sprudel ◯ Flaschenwasser **ohne** Sprudel

◯ Leitungswasser **mit** Sprudel ◯ Flaschenwasser **mit** Sprudel

Sie haben selbst Gäste zu sich nach Hause eingeladen, die Wasser trinken möchten.	*Gar nicht*	*Wenig*	*Mittelmässig*	*Stark*	*Sehr stark*	
Wie stark fühlen Sie sich dazu verpflichtet, Flaschenwasser zu servieren?	◯	◯	◯	◯	◯	[119]

Sie sind zu Gast bei Freunden und Bekannten und möchten Wasser trinken.	*Sehr passend*	*Passend*	*Etwas passend*	*Weder noch*	*Etwas unpassend*	*Unpassend*	*Sehr unpassend*	
Wie unpassend finden Sie es, wenn Ihnen Leitungswasser serviert wird?	◯	◯	◯	◯	◯	◯	◯	[120]

Sie sind im Restaurant oder in einer Bar und möchten Wasser trinken.	*Gar nicht*	*Wenig*	*Mittelmässig*	*Stark*	*Sehr stark*	
Wie stark fühlen Sie sich dazu verpflichtet, Flaschenwasser zu konsumieren?	◯	◯	◯	◯	◯	[121]

Seite 6

Wie viele ihrer Bekannten, Kollegen, Freunde und Verwandten trinken **zu Hause** ...	*Niemand*	*Wenige*	*Mittel*	*Viele*	*Sehr viele*	
... Leitungswasser?	◯	◯	◯	◯	◯	[122]
... Flaschenwasser?	◯	◯	◯	◯	◯	[123]

Wie viele ihrer Bekannten, Kollegen, Freunde und Verwandten trinken **an der Arbeitsstelle** ...	*Niemand*	*Wenige*	*Mittel*	*Viele*	*Sehr viele*	
... Leitungswasser?	◯	◯	◯	◯	◯	[124]
... Flaschenwasser?	◯	◯	◯	◯	◯	[125]

➡ Beachten Sie bei den nun folgenden Fragen noch einmal, dass Heissgetränke, Softdrinks und alkoholische Getränke (Tee, Kaffee, Cola, Rivella, Wein, Bier, Mixgetränke etc.) **nicht zum Trinkwasser zählen**.

Welche Menge Leitungswasser und welche Menge Flaschenwasser (**kein Kaffee, kein Tee!**) trinken Sie an einem normalen Wochentag **zu Hause**? Bitte geben Sie die Menge in Liter an (wenn nötig mit Komma), Beispiel: Ein Glas = ca. **0.2** Liter.

Leitungswasser: .....Liter [126] Flaschenwasser: .....Liter [127]

Das heisst, Sie trinken zu Hause am meisten ...

◯ ... Leitungswasser ◯ ... Flaschenwasser

Wie wichtig ist **jeder einzelne** der folgenden Gründe für diese Wahl:	*Nicht wichtig*	*Wenig wichtig*	*Wichtig*	*Sehr wichtig*	
Temperatur des Wassers	◯	◯	◯	◯	[128]
Geschmack	◯	◯	◯	◯	[129]
Preis	◯	◯	◯	◯	[130]
Gesundheit	◯	◯	◯	◯	[131]
Bequemlichkeit	◯	◯	◯	◯	[132]
Umweltverträglichkeit	◯	◯	◯	◯	[133]
Gewohnheit	◯	◯	◯	◯	[134]
Leicht verfügbar	◯	◯	◯	◯	[135]
Was andere über Sie in dieser Situation denken	◯	◯	◯	◯	[136]
Was andere in dieser Situation tun	◯	◯	◯	◯	[137]
Reinheit	◯	◯	◯	◯	[138]
Wasser hat Kohlensäure	◯	◯	◯	◯	[139]
Vertrauen in die Qualität	◯	◯	◯	◯	[140]

➡ **Achtung:** Wenn Sie sich die meiste Zeit **zu Hause** aufhalten (z.B. Pensionäre, Hausfrauen), gehen Sie direkt weiter zu **Seite 9**.

Seite 8

Welche Menge Leitungswasser und welche Menge Flaschenwasser (**kein Kaffee, kein Tee!**) trinken Sie an einem normalen Tag **an Ihrer Arbeitsstelle** (in Liter, wenn nötig mit Komma)?

Leitungswasser: . . . . . Liter [141] Flaschenwasser: . . . . . Liter [142]

Das heisst, Sie trinken an Ihrer Arbeitsstelle am meisten . . .

◯ . . . Leitungswasser ◯ . . . Flaschenwasser

Wie wichtig ist **jeder einzelne** der folgenden Gründe für diese Wahl:	*Nicht wichtig*	*Wenig wichtig*	*Wichtig*	*Sehr wichtig*	
Temperatur des Wassers	◯	◯	◯	◯	[143]
Geschmack	◯	◯	◯	◯	[144]
Preis	◯	◯	◯	◯	[145]
Gesundheit	◯	◯	◯	◯	[146]
Bequemlichkeit	◯	◯	◯	◯	[147]
Umweltverträglichkeit	◯	◯	◯	◯	[148]
Gewohnheit	◯	◯	◯	◯	[149]
Leicht verfügbar	◯	◯	◯	◯	[150]
Was andere über Sie in dieser Situation denken	◯	◯	◯	◯	[151]
Was andere in dieser Situation tun	◯	◯	◯	◯	[152]
Reinheit	◯	◯	◯	◯	[153]
Wasser hat Kohlensäure	◯	◯	◯	◯	[154]
Vertrauen in die Qualität	◯	◯	◯	◯	[155]

➡ Wir möchten Sie nun bitten, verschiedene vorgegebene Informationsquellen zu beurteilen. Zusätzlich möchten wir von Ihnen wissen, wie viele Informationen über Leitungs- und Flaschenwasser Sie aus diesen Quellen erhalten, z.B. Preis, Angebote, Qualität, Herkunft etc.

Wie häufig nutzen Sie **ganz generell** die folgenden Informationsquellen?	*Nie*	*Selten*	*Ab und zu*	*Oft*	*Sehr oft*	
Radio/TV	◯	◯	◯	◯	◯	[156]
Internet (online)	◯	◯	◯	◯	◯	[157]
Zeitungen, Zeitschriften, Magazinen (gedruckt)	◯	◯	◯	◯	◯	[158]

Wie viele Informationen **bezüglich Leitungs- und Flaschenwasser** erhalten Sie aus jeder der folgenden vier Quellen?	*Keine*	*Wenige*	*Mittlere Menge*	*Viele*	*Sehr viele*	
Aus Radio/TV	◯	◯	◯	◯	◯	[159]
Aus dem Internet (online)	◯	◯	◯	◯	◯	[160]
Aus Zeitungen, Zeitschriften, Magazinen (gedruckt)	◯	◯	◯	◯	◯	[161]
Aus Gesprächen	◯	◯	◯	◯	◯	[162]

Wie glaubwürdig sind diese **Informationen über Trinkwasser** aus jeder der folgenden vier Quellen für Sie?	*Nicht glaubwürdig*	*Wenig glaubwürdig*	*Glaubwürdig*	*Sehr glaubwürdig*	
Radio/TV	◯	◯	◯	◯	[163]
Internet	◯	◯	◯	◯	[164]
Zeitungen	◯	◯	◯	◯	[165]
Gespräche	◯	◯	◯	◯	[166]

Seite 10

➡ Die folgenden Fragen beziehen sich auf Wasserbehandlungsgeräte. Solche Geräte sind zum Beispiel Wasserfilter, Sprudelgeräte oder auch Entkalkungsanlagen, die Sie im Haushalt verwenden oder installiert haben. **Nicht** dazu zählen jedoch die Kaffeemaschine oder der Teekocher.

Wie viel wissen Sie ganz allgemein über Wasserbehandlungsgeräte?

Gar nichts	Wenig	Mittel	Viel	Sehr viel	
○	○	○	○	○	[167]

Welche Geräte (Marke, Typ etc.) zur Wasserbehandlung verwenden Sie? [168]

.....

.....

Und warum nutzen Sie diese Geräte? [169]

.....

.....

➡ **Achtung:** Wenn Sie keine solche Geräte verwenden **und** auch kein Wissen über solche Geräte haben, gehen Sie bitte direkt weiter zu **Seite 12**.

Verwenden Sie das Gerät auch, um die Trinkqualität Ihres Wassers zu verbessern?

○ Nein ○ Ja [170]

Wie zufrieden sind Sie mit Wasserbehandlungsgeräten?

Sehr unzufrieden	Unzufrieden	Etwas unzufrieden	Weder noch	Etwas zufrieden	Zufrieden	Sehr zufrieden	
○	○	○	○	○	○	○	[171]

Für wie gesund halten Sie Wasser, welches Sie mit Wasserbehandlungsgeräten behandelt haben?

Sehr ungesund	*Ungesund*	*Etwas ungesund*	*Weder noch*	*Etwas gesund*	*Gesund*	*Sehr gesund*	
○	○	○	○	○	○	○	[172]

Wie oft haben Sie schon negative Erfahrungen mit Wasserbehandlungsgeräten gemacht?

Nie	*Selten*	*Manchmal*	*Oft*	*Sehr oft*	
○	○	○	○	○	[173]

Wie billig/teuer sind Wasserbehandlungsgeräte Ihrem Wissen nach?

Sehr teuer	*Teuer*	*Etwas teuer*	*Weder noch*	*Etwas billig*	*Billig*	*Sehr billig*	
○	○	○	○	○	○	○	[174]

Seite 12

➡ Im Folgenden schildern wir Ihnen bestimmte Situationen. Bitte versetzen Sie sich in diese Situationen hinein und stellen Sie sich vor, Sie befänden sich in dieser Situation. Beantworten Sie bitte dann die Fragen.

Sie haben aus den Nachrichten erfahren, dass die Trinkqualität für Ihr Leitungswasser künftig nicht mehr garantiert wird. Stattdessen werden Sie dazu aufgefordert, die Trinkqualität selbst herzustellen (z.B. durch Abkochen oder den Kauf von Flaschenwasser).

Wie stark sehen Sie Ihre Identität als Bürger/Bewohner der Schweiz verletzt?

Gar nicht	*Wenig*	*Mittelmässig*	*Stark*	*Sehr stark*	
○	○	○	○	○	[175]

Wie stark sehen Sie sich in dieser Situation zu einer Verhaltensänderung gezwungen?

Gar nicht	*Wenig*	*Mittelmässig*	*Stark*	*Sehr stark*	
○	○	○	○	○	[176]

Wie viel Angst empfinden Sie in dieser Situation?

Gar keine	*Wenig*	*Mittelmässig*	*Viel*	*Sehr viel*	
○	○	○	○	○	[177]

Eine Studie zeigte: Flaschenwasser ist bis zu 1000 Mal teurer als Leitungswasser, und es belastet auch die Umwelt deutlich mehr. Wenn Sie nun an Ihren eigenen Trinkwasserkonsum (z.B. die bevorzugte Wassersorte) denken, . . .

. . . wie angenehm wirkt diese Information auf Sie?

Sehr unangenehm	*Unangenehm*	*Ein bisschen unangenehm*	*Weder noch*	*Ein bisschen angenehm*	*Angenehm*	*Sehr angenehm*	
○	○	○	○	○	○	○	[178]

Und wieso wirkt sie so unangenehm oder angenehm? [179]

. . . . . .

Der Trinkwasserversorger Ihrer Gemeinde beschliesst, aus Kostengründen zukünftig nur noch Leitungswasser anzubieten, welches zwar sauber ist (zum Waschen und Zähneputzen), welches man allerdings nicht mehr trinken kann. Sie müssen Ihr Trinkwasser also selbst aufbereiten, um Trinkqualität herzustellen. Andere Trinkwasserversorger (z.B. in der Nachbargemeinde) liefern jedoch weiterhin Trinkwasserqualität.

Wie viel Neid empfinden Sie auf jene Personen, die von deren Trinkwasserversorger nach wie vor mit trinkbarem Leitungswasser beliefert werden?

Gar keinen	*Wenig*	*Mittelmässig*	*Viel*	*Sehr viel*	
○	○	○	○	○	[180]

Wie viel Mitleid empfinden Sie mit anderen Personen, die dieser Situation ausgesetzt sind?

Gar keins	*Wenig*	*Mittelmässig*	*Viel*	*Sehr viel*	
○	○	○	○	○	[181]

Wie gerecht empfinden Sie diese Situation?

Sehr ungerecht	*Ungerecht*	*Ein bisschen ungerecht*	*Weder noch*	*Ein bisschen gerecht*	*Gerecht*	*Sehr gerecht*	
○	○	○	○	○	○	○	[182]

Wie viel Ärger empfinden Sie in dieser Situation?

Gar keinen	*Wenig*	*Mittelmässig*	*Viel*	*Sehr viel*	
○	○	○	○	○	[183]

Seite 14

➡ Nachfolgend möchten wir noch etwas mehr über Sie erfahren, um abzusichern, dass wir wirklich eine breite Meinung der Schweizer Bevölkerung erhoben haben. Wie Ihnen bereits versichert wurde, werden Ihre Angaben selbstverständlich vertraulich behandelt.

Ihr Geburtsjahr:..... [184]

Ihr Geschlecht: ◯ Weiblich ◯ Männlich [185]

Wie viele Personen wohnen in Ihrem Haushalt (Sie selbst eingeschlossen)?

.....Personen [186]

Welcher Bevölkerungsschicht würden Sie sich am ehesten zurechnen? [187]

◯ Unterschicht

◯ Arbeiterschicht

◯ Mittelschicht

◯ Obere Mittelschicht

◯ Oberschicht

In welcher Gemeinde (ggf. auch Kanton) wohnen Sie? [188]

.....

.....

Welcher der folgenden Bildungsabschlüsse ist Ihr **höchster** Abschluss? [189]

- ◯ Primarstufe (Grundschule)
- ◯ Sekundarstufe I (Sekundarschule, Realschule, Oberschule, Sek A, Sek B)
- ◯ Sekundarstufe II (Gymnasium, Lehre, Lehrpatent, Handelsmittelschule, Matura, Berufsmatura, Berufsausbildung, Fachabitur, Abitur, Fachmittelschule)
- ◯ Höhere Berufsbildung, Hochschule (Diplome, Universitätsabschlüsse, Hochschule, Fachhochschule, Fachabschluss, Meister)
- ◯ Nachdiplom (Diplome der höheren Berufsbildung und der Weiterbildung oder Vertiefung an Fachhochschulen oder Universitäten)
- ◯ Doktorat/Promotion/Habilitation

Beim durchschnittlichen Pro-Kopf-Einkommen in Ihrem Haushalt interessiert uns **nicht** der exakte Betrag sondern lediglich, in welche Kategorie Sie sich einordnen. Dies hilft uns, mögliche Zusammenhänge zwischen Einkommen und Wasserkonsum zu überprüfen. Bitte schätzen Sie das **Brutto**-Gesamteinkommen in Ihrem Haushalt pro Jahr (**alle** Personen zusammen). [190]

- ◯ 24’000 CHF und weniger
- ◯ 24’001 bis 48’000 CHF
- ◯ 48’001 bis 72’000 CHF
- ◯ 72’001 bis 96’000 CHF
- ◯ 96’001 bis 120’000 CHF
- ◯ Mehr als 120’000 CHF

Beispiel:

Person 1 (Lohn):	SFr.	96’000.00
Person 2 (Lohn):	SFr.	60’000.00
Person 3 (Lehrlingslohn):	SFr.	18’000.00
Person 4 (Schülerin):	SFr.	0.00
Summe	SFr.	174’000.00
geteilt durch 4 Personen	SFr.	43’500.00

→ Kategorie 2 (24–48 T CHF)

Seite 16

Wenn Sie am Gewinnspiel teilnehmen möchten, geben Sie bitte Ihre E-Mail-Adresse an. Wenn Sie keine E-Mail-Adresse besitzen, geben Sie bitte Ihre Telefonnummer (nur Schweizer Nummern) an. Diese Daten werden **nicht** mit Ihren übrigen Antworten gespeichert und nach Benachrichtigung der Gewinner gelöscht.

E-Mail-Adresse: .....@.....

Telefonnummer: +41 .....

Platz für Ihre Kommentare (bitte nur Druckbuchstaben).

.....

.....

.....

.....

.....

.....

.....

Senden Sie uns den Fragebogen nun bitte im beigefügten Antwortumschlag zurück.

Herzlichen Dank für Ihre Teilnahme!

B. Questionnaire for Assessment of Point-of-Use-Systems Nairobi, Kenya

UNIVERSITY OF NAIROBI (UoN)

and

KENYA WATER FOR HEALTH ORGANIZATION (KWAHO)

and

SWISS FEDERAL INSTITUTE OF AQUATIC SCIENCE AND TECHNOLOGY (Eawag)

Preliminaries

Please give the following information that should record facts concerning the interviewer as well as the situation in which the interview was conducted.

(1) Name of the interviewer	
(2) Estate where the interview is conducted	
(3) Date and time of the interview	

Introduction

The following paragraphs give a brief introduction to the interview, its concerns, purposes, and the questions' synthesis. Please read the following information carefully since it will help to keep track of the interview process.

Our survey tries to explore the drinking water situation in households in Nairobi. Among other things, we are interested in water types, treatment types, experiences, knowledge, as well as ideas or presumptions. The survey will include a total of about 600 households, and their answers will provide a great opportunity to help evaluate—and perhaps in further steps improve—the drinking water situation in Nairobi.

The interview will take about 30 minutes. It addresses to the member of the household who is **responsible for the household's drinking water concerns**. Each question will be explained and introduced. If you do not understand a certain question, please feel free to ask the interviewer. After your answer has been recorded by the interviewer, the interview will continue with the next question.

Please note that all the questions apply to the **whole household**. Also, the term "drinking water" always only refers to water that you **intend/plan to drink but haven't already treated yourself**. This also includes buying bottled water.

Again, we are not interested in any particular answer, just in the answers that really represent your opinion. We do not want you to engage in any behaviour, rather we would like to know why people are doing what they are doing. We would like to get as much information as possible and therefore some questions might occur similar to you—we are sorry if they seem to be repetitive.

Thank you for participating.

1 Demographic information of the interviewee

Please give the following information concerning general information about the interviewee.

(1) Name and surname of the interviewee	
(2) House number, flat number, street (if possible)	
(3) Sex of the interviewee	○ (1) Male ○ (2) Female
(4) Education of the interviewee (highest degree)	○ (1) None ○ (2) Primary School ○ (3) Secondary School ○ (4) College ○ (5) University degree ○ (6) Others, namely: …
(5) Occupation of the interviewee	○ (1) Unemployed ○ (2) Casual labourer ○ (3) Housewives ○ (4) Farming ○ (5) Employed ○ (6) Informal activity ○ (7) Self-employed ○ (8) Student ○ (9) Others, namely: …
(6) Number of persons in the household	
(7) Ages of the persons in the household (separate ages by commas)	

In order to get an impression of your livelihood, please give also the following information.

(8) Number of rooms in the household	
(9) Number of bedrooms in the household	
(10) Combined family income (in Ksh/month)	○ (1) less than 5,000 ○ (2) 5,001 – 10,000 ○ (3) 10,001 – 20,000 ○ (4) 20,001 – 30,000 ○ (5) 30,001 – 50,000 ○ (6) 50,001 – 100,000 ○ (7) more than 100,000

2 Main drinking water source

Please give the following information concerning the household's main drinking water source. Please give the information for that source, where your retrieve **most of your drinking water**.

(1) Drinking water source	○ (1) Municipal water provider/Nairobi Water And Sewerage Company ○ (2) Borehole ○ (3) Spring ○ (4) Bottled water ○ (5) Rain water ○ (6) Water tanks ○ (7) Water vendors ○ (8) Other, namely: …
(2) How do you fetch your water?	○ (1) From the in-house tap ○ (2) From the public tap in the compound ○ (3) Other public supply, namely: … ○ (4) Buy bottled Water ○ (5) Other, namely: …
(3) How much do you trust in your water supplier?	○ (1) Very much ○ (2) Much ○ (3) A little bit ○ (4) Not at all
(4) How many hours a day is water continuously available?	
(5) How many days a week is water continuously available?	
(6) What is the water's average quality?	○ (1) Very good quality ○ (2) Good quality ○ (3) Quite good quality ○ (4) Medium quality ○ (5) Quite bad quality ○ (6) Bad quality ○ (7) Very bad quality
(7) What do you think, from which substance or material is this water contaminated? Mark every entry that matches.	○ (1) Not contaminated at all ○ (2) Bacteria ○ (3) Chemicals ○ (4) Others, namely: …
(8) Do you think your water is drinkable?	○ (1) Yes ○ (2) Yes, but: … ○ (3) No ○ (4) No, but: …

(9) How is the nature/composition of the water? Please mark every matching adjective according to the categories' headers.		
(a) Odour (i.e. foully)	(b) Flavour (i.e. salty)	(c) Appearance/Turbidity (i.e. dirty)
○ (1) Foully ○ (2) With the odour of fish ○ (3) Neutral ○ (4) Others, namely: …	○ (1) Salty ○ (2) Bitter ○ (3) Sour ○ (4) Chlorine tasting ○ (5) Earthy ○ (6) Sweet ○ (7) Metallic ○ (8) Neutral ○ (9) Others, namely: …	○ (1) Muddy ○ (2) Dirty ○ (3) Clear ○ (4) Coloured, namely: … ○ (5) Others, namely: …

3 Water collection and storage

(1) Who normally collects water in the household (please give name and relation)?	
(2) Where do you store your water that you intend to drink and which is not already treated by yourself? Please select the answer where you store most of that water.	○ (1) Don't store ○ (2) In-house ○ (3) Outside the household

Only proceed with the following questions in this section, if you **store** your water! Please give the answer for that storage **where you store most of your water**.

(3) What kind of storage do you use?	○ (1) Buckets ○ (2) Jerry cans ○ (3) Bottles ○ (4) Tanks outside ○ (5) In-built tanks ○ (6) Other, namely: …
(4) Where do you store these containers?	○ (1) In-house: Kitchen ○ (2) In-house: Fridge ○ (3) Outside: Roof top ○ (4) Outside: Compound ○ (5) Outside: Underground ○ (6) Other, namely: …
(5) For how long do you store water on average (in days)?	
(6) What is the water storage capacity (in litres)?	

4 Drinking water consumption

Please give the following information concerning the household's drinking water consumption of each of the listed water sources. Please note that some entries may overlap.

(1) How much water do you consume as a family (in litres per day/week/month, if not known take the last week as an example; 4 cups = 1 lire, 4 glasses = 1 litre, jerry can: let show you and calculate the amount of litres).			
Source	(a) Per day	(b) Per week	(c) Per month
(1) Treated water including bottled water			
(2) Untreated water excluding bottled water			

Please give the amount of consumed water of each of the listed water sources. Please note that entries may overlap.

(2) How much water do you consume as a family (in litres per day/week/month, if not known take the last week as an example; 4 cups = 1 lire, 4 glasses = 1 litre, jerry can: let show you and calculate the amount of litres).			
Source	(a) Per day	(b) Per week	(c) Per month
(1) In-house tap water			
(2) Public tap water			
(3) Bottled water			
(4) Water from public supply			
(5) Borehole water			
(6) Spring water			
(7) Rain water			
(8) Water from the water tank			

(3) How much do you pay on average for your **drinking water** (in Ksh)? Please fill in at least one of the cells.		
(a) Per day?	(b) Per Week	(c) Per Month

5 Health related issues

Information concerning the household's experiences and knowledge with illnesses due to drinking water consumption.

(1) How responsible do you feel for your health and the health of your family?	○ (1) Very responsible ○ (2) Responsible ○ (3) A little bit responsible ○ (4) Not responsible at all
(2) How important is it for you that your drinking water is healthy?	○ (1) Very important ○ (2) Important ○ (3) A little bit important ○ (4) Not important at all
(3) Do you think that drinking untreated water makes you healthier or unhealthier?	○ (1) A lot healthier ○ (2) Healthier ○ (3) A little bit healthier ○ (4) Neither healthier nor unhealthier ○ (5) A little bit unhealthier ○ (6) Unhealthier ○ (7) A lot more unhealthy
(4) How many members of your household in total have suffered from an illness due to water consumption during the last 3 months (i.e. amoeba, typhoid, diarrhoea)?	
(5) **If previous answer *not* zero:** And how many times in total did this happen during the last 3 months?	
(6) Do you think that there's any link between illnesses and the consumption of untreated water?	○ (1) Yes ○ (2) No ○ (3) I don't know
(7) **If yes**, what is the main link?	

Please give the following information concerning available and used sanitation facilities.

(8) How many of each of the following sanitation facilities are available at your household? And how many people use this facility?			
Sanitation facility		(a) How many of them?	(b) How many people use it?
(1) Ordinary pit latrine			
(2) VIP pit latrine			
(3) Flush toilet			
(4) Flying toilet			
(5) Open defecation			
(6) Hand washing basin			
(7) Bath room			
(8) Shower			
(9) Others, namely:	…		

6 Drinking water treatment

In order to prepare the water from your **main water source** for drinking quality

- several treatment methods may be applied to the water (i.e. boiling, chlorination, etc.),
- the water may be treated with a certain device (ceramic filters, SODIS, etc.),
- or you may buy already treated water, i.e. in bottles (mineral water).

The word "treatment" therefore includes every method, device, or action (including buying bottled water) that may help to provide you with clean water. The following questions will record information about these treatments. Subsection 6.1 asks for treatments that are used, and subsection 6.2 asks for treatments that are known but **not** used. Finally, subsection 6.3 asks for water treatment in general.

Please note again, that throughout the hole section 6 "treatment", "device", and "method" are used in a similar context and therefore include also buying treated water, i.e. bottled water. Thus, treatment will refer to one (or more) of the following treatments:

(1) Ceramic filters

(2) Straw filters

(3) Chemical disinfection (chlorine, AQUA-tabs, etc.)

(4) Sand filter

(5) SODIS

(6) Boiling

(7) Buying bottled water

(8) UV treatment (UV lamps, etc.)

(9) Integrated systems (i.e with reverse osmosis, UV, and chemicals)

Please note also that the following questions **exclusively** refer to consumption **in the household**. No answer is to be given concerning consumption aspects elsewhere, i.e. street, office or restaurant.

6.1 Treatments used

Please give the following information concerning the household's drinking water treatment knowledge and use. Please refer to one or more of the following treatments: (1) ceramic filters, (2) straw filters, (3) chemical disinfection (chlorine, AQUA-tabs, etc.), (4) sand filter, (5) SODIS, (6) boiling, (7) buying bottled water, (8) UV treatment (UV lamps, etc.), (9) integrated systems (i.e. with reverse osmosis, UV, and chemicals).

	Treatment a	Treatment b	Treatment c	Scale
(1) Which of the listed water treatments do you use? Please fill in the name.				
(2) How much does it cost (**Ksh per month**)?				
(3) When do you treat your water with this treatment?	**O** (1) **O** (2) **O** (3)	**O** (1) **O** (2) **O** (3)	**O** (1) **O** (2) **O** (3)	At certain times of the day At certain events of the day Randomly, coincidentally
(4) How easy is it for you to use this treatment?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very easy Easy Quite easy Neither easy nor difficult Quite difficult Difficult Very difficult
(5) How cheap/expensive is this treatment for you?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very cheap Cheap Quite cheap Neither cheap nor expensive Quite expensive Expensive Very expensive
(6) How reliable is this treatment for you concerning water quality?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very reliable Reliable Quite reliable Neither reliable nor unreliable Quite unreliable Unreliable Very unreliable
(7) How effectively does this treatment work?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very effectively Effectively Quite effectively Neither effectively nor ineffectively Quite ineffectively Ineffectively Very ineffectively
(8) How available is the treatment?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very plentiful Plentiful Quite plentiful Neither plentiful nor scarce Quite scarce Scarce Very scarce

	Treatment a	Treatment b	Treatment c	Scale
(9) How much does this treatment enhance or diminish the odour?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very much enhances Enhances A little bit enhances Neither enhances nor diminishes A little bit diminishes Diminishes Very much diminishes
(10) How much does this treatment enhance or diminish the flavour?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very much enhances Enhances A little bit enhances Neither enhances nor diminishes A little bit diminishes Diminishes Very much diminishes
(11) How much does this treatment enhance or diminish the appearance?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very much enhances Enhances A little bit enhances Neither enhances nor diminishes A little bit diminishes Diminishes Very much diminishes
(12) How time-consuming is it for you to use this treatment?	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	Very time-consuming Time-consuming Quite time-consuming Not time-consuming at all
(13) Do you think your drinking-water becomes healthier or unhealthier if you treat it with this treatment?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	A lot healthier Healthier A little bit healthier Neither healthier nor unhealthier A little bit unhealthier Unhealthier A lot more unhealthy
(14) How many people do you know who use this treatment?				
(15) How would other people think about you when you talk about this treatment?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very positively Positively Quite positively Neither positively nor negatively Quite negatively Negatively Very negatively
(16) How would other people think about you when you use this treatment?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7)	Very positively Positively Quite positively Neither positively nor negatively Quite negatively Negatively Very negatively

6.2 Treatments known but not used

Please give the following information concerning the household's drinking water treatment knowledge and use. In contrast to the previous subsection, we would now like to know, which other treatments you know, but do not use. Please refer to one or more of the following treatments: (1) ceramic filters, (2) straw filters, (3) chemical disinfection (chlorine, AQUA-tabs, etc.), (4) sand filter, (5) SODIS, (6) boiling, (7) buying bottled water, (8) UV treatment (UV lamps, etc.), (9) integrated systems (i.e with reverse osmosis, UV, and chemicals).

	Treatment a	Treatment b	Treatment c	Scale
(1) Which water treatment do you know of but do not use? Please fill in the name.				
(2) Who uses this treatment?	**O** (1) **O** (2) **O** (3) **...** (4) **O** (5)	**O** (1) **O** (2) **O** (3) **...** (4) **O** (5)	**O** (1) **O** (2) **O** (3) **...** (4) **O** (5)	Friends Relatives Neighbours Others, namely: I don't know
(3) How many people do you know who use this treatment?				
(4) How much does it cost (Ksh **per month**)?				
(5) How easy would it be for you to use this treatment?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	Very easy Easy Quite easy Neither easy nor difficult Quite difficult Difficult Very difficult I don't know
(6) How cheap/expensive is this treatment/would this treatment be?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	Very cheap Cheap Quite cheap Neither cheap nor expensive Quite expensive Expensive Very expensive I don't know
(7) How reliable would this treatment be for you concerning water quality?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	Very reliable Reliable Quite reliable Neither reliable nor unreliable Quite unreliable Unreliable Very unreliable I don't know

	Treatment a	Treatment b	Treatment c	Scale
(8) How effectively would this treatment work?	**O** (1)	**O** (1)	**O** (1)	Very effectively
	O (2)	**O** (2)	**O** (2)	Effectively
	O (3)	**O** (3)	**O** (3)	Quite effectively
	O (4)	**O** (4)	**O** (4)	Neither effective nor ineffectively
	O (5)	**O** (5)	**O** (5)	Quite ineffectively
	O (6)	**O** (6)	**O** (6)	Ineffectively
	O (7)	**O** (7)	**O** (7)	Very ineffectively
	O (8)	**O** (8)	**O** (8)	I don't know
(9) How available is the treatment?	**O** (1)	**O** (1)	**O** (1)	Very plentiful
	O (2)	**O** (2)	**O** (2)	Plentiful
	O (3)	**O** (3)	**O** (3)	Quite plentiful
	O (4)	**O** (4)	**O** (4)	Neither plentiful nor scarce
	O (5)	**O** (5)	**O** (5)	Quite scarce
	O (6)	**O** (6)	**O** (6)	Scarce
	O (7)	**O** (7)	**O** (7)	Very scarce
	O (8)	**O** (8)	**O** (8)	I don't know
(10) How much would this treatment enhance or diminish the odour?	**O** (1)	**O** (1)	**O** (1)	Very much enhances
	O (2)	**O** (2)	**O** (2)	Enhances
	O (3)	**O** (3)	**O** (3)	A little bit enhances
	O (4)	**O** (4)	**O** (4)	Neither enhances nor diminishes
	O (5)	**O** (5)	**O** (5)	A little bit diminishes
	O (6)	**O** (6)	**O** (6)	Diminishes
	O (7)	**O** (7)	**O** (7)	Very much diminishes
	O (8)	**O** (8)	**O** (8)	I don't know
(11) How much would this treatment enhance or diminish the flavour?	**O** (1)	**O** (1)	**O** (1)	Very much enhances
	O (2)	**O** (2)	**O** (2)	Enhances
	O (3)	**O** (3)	**O** (3)	A little bit enhances
	O (4)	**O** (4)	**O** (4)	Neither enhances nor diminishes
	O (5)	**O** (5)	**O** (5)	A little bit diminishes
	O (6)	**O** (6)	**O** (6)	Diminishes
	O (7)	**O** (7)	**O** (7)	Very much diminishes
	O (8)	**O** (8)	**O** (8)	I don't know
(12) How much would this treatment enhance or diminish the appearance?	**O** (1)	**O** (1)	**O** (1)	Very much enhances
	O (2)	**O** (2)	**O** (2)	Enhances
	O (3)	**O** (3)	**O** (3)	A little bit enhances
	O (4)	**O** (4)	**O** (4)	Neither enhances nor diminishes
	O (5)	**O** (5)	**O** (5)	A little bit diminishes
	O (6)	**O** (6)	**O** (6)	Diminishes
	O (7)	**O** (7)	**O** (7)	Very much diminishes
	O (8)	**O** (8)	**O** (8)	I don't know
(13) How time-consuming would it be for you to use this treatment?	**O** (1)	**O** (1)	**O** (1)	Very time-consuming
	O (2)	**O** (2)	**O** (2)	Time-consuming
	O (3)	**O** (3)	**O** (3)	Quite time-consuming
	O (4)	**O** (4)	**O** (4)	Not time-consuming at all
	O (5)	**O** (5)	**O** (5)	I don't know

	Treatment a	Treatment b	Treatment c	Scale
(14) Do you think your drinking-water would become healthier or unhealthier if you treated it with this treatment?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	A lot healthier Healthier A little bit healthier Neither healthier nor unhealthier A little bit unhealthier Unhealthier A lot more unhealthy I don't know
(15) How would other people think about you when you would use this treatment?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	Very positively Positively Quite positively Neither positively nor negatively Quite negatively Negatively Very negatively I don't know

6.3 Beliefs about water treatment

(1) In general, considering the costs involved, do you think it is (it would be) worth treating your drinking water?	○ (1) It is worth a lot more than it costs ○ (2) It is worth more than it costs ○ (3) It is worth a little bit more than it costs ○ (4) It is worth the same as it costs ○ (5) It costs a little bit more than it is worth ○ (6) It costs more than it is worth ○ (7) It costs a lot more than it is worth

Remember whether the interviewee drinks water from the source directly or not. Then continue with the following question using the **right** verb—"do/don't".

(2) Why do/don't you drink your water from the source directly?	
(3) Do you think it is good or bad to treat your water with treatments or use already treated water (i.e. bottled water)?	○ (1) Very good ○ (2) Good ○ (3) Quite good ○ (4) Neither good nor bad ○ (5) Quite bad ○ (6) Bad ○ (7) Very bad
(4) Do you think it is good or bad to talk about topics concerning water quality with friends?	○ (1) Very good ○ (2) Good ○ (3) Quite good ○ (4) Neither good nor bad ○ (5) Quite bad ○ (6) Bad ○ (7) Very bad
(5) How much do you trust yourself concerning the proper water treatment (or if you do not treat: concerning that you do the right things)?	○ (1) Very much ○ (2) Much ○ (3) A little bit ○ (4) Not at all
(6) **If you treat:** How many times did it happen during the last week that you intended to treat your water with your preferred water treatment and then forget to do so?	
(7) How embarrassed would you feel if you do not treat your water (with your preferred treatment method)?	○ (1) Very embarrassed ○ (2) Embarrassed ○ (3) Quite embarrassed ○ (4) No embarrassed at all
(8) **(Do treat? Don't treat? Use right verb!)** How unfair is it that you do (don't) have to treat your water in order to get proper quality whilst others don't (do)?	○ (1) Very unfair ○ (2) Unfair ○ (3) Little unfair ○ (4) Not unfair at all
(9) How much anxiety do you experience about illnesses that are related to a contamination of your drinking water?	○ (1) Very much anxiety ○ (2) Much anxiety ○ (3) Little anxiety ○ (4) No anxiety at all
(10) How compelled do you feel to use any household drinking water treatment?	○ (1) Very compelled ○ (2) Compelled ○ (3) Quite compelled ○ (4) Not compelled at all

Please think now of your drinking water behaviour and the situation (i.e. comfort) in your household. Answer the following questions according to your drinking water behaviour and situation (including the use of treatments) in your household.

(11) To what extent do you experience a contradiction in your drinking water behaviour between what you currently do and what you actually would do?	○ (1) Very high extent ○ (2) High extent ○ (3) Low extent ○ (4) No contradiction at all
(12) How much does your drinking water behaviour and/or situation increase or decrease your self-esteem?	○ (1) Very much increases ○ (2) Increases ○ (3) A little bit increases ○ (4) Neither increases nor decreases ○ (5) A little bit decreases ○ (6) Decreases ○ (7) Very much decreases
(13) To what extent does your drinking water behaviour and/or situation increase or decrease your social image?	○ (1) Very much increases ○ (2) Increases ○ (3) A little bit increases ○ (4) Neither increases nor decreases ○ (5) A little bit decreases ○ (6) Decreases ○ (7) Very much decreases
(14) To what extent do you feel superior or inferior when you think about the drinking water situation in your household?	○ (1) Very superior ○ (2) Superior ○ (3) Quite superior ○ (4) Neither superior nor inferior ○ (5) Quite inferior ○ (6) Inferior ○ (7) Very inferior
(15) To what extent are you responsible for your current drinking water situation?	○ (1) Very responsible ○ (2) Responsible ○ (3) Quite responsible ○ (4) Not responsible at all
(16) How much worry do you experience when you think about the drinking water situation in your household?	○ (1) Very much worry ○ (2) Much worry ○ (3) Little worry ○ (4) No worry at all
(17) How much sympathy do you experience when you think about the drinking water situation of others compared to that of your household?	○ (1) Very much sympathy ○ (2) Much sympathy ○ (3) Little sympathy ○ (4) No sympathy at all

7 Communication and information concerning water quality, treatment, and Point-of-Use-systems

The following questions try to explore, where your household retrieves drinking water treatment related information from. Therefore, we present you with some information channels. Please give the information to each particular channel. Due to limited space, the section divides itself into two separate tables (table 1 and table 2), each with four channels, and each one asks the same questions. Table 2 lets you add two channels of information which are not already mentioned.

Table 1

	(a) Public Campaigns	(b) Advertising	(c) TV/Radio/ Newspapers/ Libraries/ Internet	(d) Information from your profession or occupation	Scale
(1) How often do you use this channel to retrieve information concerning water issues?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	Very often Often Quite often Neither often nor seldom Quite seldom Seldom Very seldom Not at all

Only proceed with the following questions in the columns with channels which are **at least *"very seldom"* used**.

(2) What did they recommend (briefly)?	**O** (1) **O** (2) **O** (3) **...** (4)	**O** (1) **O** (2) **O** (3) **...** (4)	**O** (1) **O** (2) **O** (3) **...** (4)	**O** (1) **O** (2) **O** (3) **...** (4)	Don't treat water Treat the water yourself Buy treated water Others, namely:
(3) How ready do you feel to follow these recommendations?	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	Very ready Ready Quite ready Not ready at all
(4) How much do you trust this channel?	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	Very much Much Little Not at all
(5) How important is it to you, what they say or think?	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	Very important Important A little bit important Not important at all

Table 2

	(e) Talks with friends and neighbours	(f) Observation of other's behaviour	(g) Health institutions/ doctors	(h) Other, namely: … (**see also footnote**)	Scale
(1) How often do you use this channel to retrieve information concerning water issues?	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	**O** (1) **O** (2) **O** (3) **O** (4) **O** (5) **O** (6) **O** (7) **O** (8)	Very often Often Quite often Neither often nor seldom Quite seldom Seldom Very seldom Not at all

Only proceed with the following questions in the columns with channels which are **at least *"very seldom"* used**.

(2) What did they recommend (briefly)?	**O** (1) **O** (2) **O** (3) **…** (4)	**O** (1) **O** (2) **O** (3) **…** (4)	**O** (1) **O** (2) **O** (3) **…** (4)	**O** (1) **O** (2) **O** (3) **…** (4)	Don't treat water Treat the water yourself Buy treated water Others, namely:
(3) How ready do you feel to follow these recommendations?	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	Very ready Ready Quite ready Not ready at all
(4) How much do you trust this channel?	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	Very much Much Little Not at all
(5) How important is it to you, what they say or think?	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	**O** (1) **O** (2) **O** (3) **O** (4)	Very important Important A little bit important Not important at all

Note concerning category "other, namely": If the information channel refers to something in the far past skip the question "How often do you use …", but **continue with the other questions** in the column!

8 Drinking water situation and suggestions

Please give the following information of the interviewee concerning the **current** drinking water situation.

(1) In your opinion, who is responsible for pure water quality?	○ (1) Consumer ○ (2) Government ○ (3) City council ○ (4) Water company ○ (5) Water vendors ○ (6) Others, namely: …
(2) Who should inform you about water quality?	○ (1) Consumer ○ (2) Government ○ (3) City council ○ (4) Water company ○ (5) Water vendors ○ (6) Others, namely: …

Please give the following information concerning **the future expectations** or **suggestion** from the interviewee, according to his/her point of view. Remember the phrases: "In 5 years", or "If it was up to you to change or decide".

(3) In the future, who should be responsible for ensuring the following aspects of drinking water:	
(1) High (drinkable) quality	○ (1) Consumer ○ (2) Government ○ (3) City council ○ (4) Water company ○ (5) Water vendors ○ (6) Others, namely: …
(2) High quantity	○ (1) Consumer ○ (2) Government ○ (3) City council ○ (4) Water company ○ (5) Water vendors ○ (6) Others, namely: …
(3) High pressure	○ (1) Consumer ○ (2) Government ○ (3) City council ○ (4) Water company ○ (5) Water vendors ○ (6) Others, namely: …
(4) Good taste, odour, and appearance	○ (1) Consumer ○ (2) Government ○ (3) City council ○ (4) Water company ○ (5) Water vendors ○ (6) Others, namely: …

9 Open comments concerning the questionnaire and the questions

(1) What final or open comments do you have? Please insert **additional** comments in the text box below.

Final concerns from the interviewer

(2) Notable circumstances concerning the interview situation (i.e. was hard to get into the flat, interview not in the flat but in front of the door etc.)
(3) Date and time when the interview was finished

C. Descriptives of the variables in the questionnaires

Table C.1.: Variables in the data set of the drinking water consumption patterns in Switzerland. Shown per factor group is the variable's short label, number of responses, statistics of responses, and (if given) the labels of the levels.

Factor label	N	M	SD	Min–Max	Levels
			Dependent variables		
BW purchase	685	30.34	33.40	1–11	0 – 45
pref type	731	24.08	42.78	1–2	Tap water – Bottled water
pref spark	731	23.26	42.28	1–2	no CO2 – with CO2
CI all	731	65.11	36.02	0–100	
CI home	731	69.24	36.52	0–100	
CI work	425	56.27	45.23	0–100	
CI home (cat)	731	69.49	33.51	1–3	BW only – TW only
CI work (cat)	425	55.76	44.33	1–3	BW only – TW only
cons tot	731	26.72	15.81	0.05–7.5	
cons tot tap	731	21.36	18.07	0–6	
cons tot bot	731	12.04	15.75	0–6	
pous any	731	0.36	0.48	0–1	
PoUS system	731	0.09	0.29	0–1	

Table C.1.: Variables in the data set in Switzerland... (continued).

Factor label	N	M	SD	Min–Max	Levels
PoUS filter	731	0.18	0.39	0–1	
PoUS soda	731	0.07	0.25	0–1	
PoUS other	731	0.02	0.14	0–1	
			Attitudinal beliefs		
res countr bad tw	722	12.60	33.21	1–2	no – yes
intrs wat topics	722	56.89	20.82	1–5	not – very much
important temp	722	62.93	29.32	1–4	not important – very important
important taste	726	76.63	22.70	1–4	not important – very important
important health	725	80.23	24.31	1–4	not important – very important
important eco	721	74.39	27.40	1–4	not important – very important
important habit	722	64.36	26.47	1–4	not important – very important
important purity	722	87.86	20.29	1–4	not important – very important
important temp	416	62.58	29.12	1–4	not important – very important
important taste	415	73.98	24.02	1–4	not important – very important

Table C.1.: Variables in the data set in Switzerland... (continued).

Factor label	N	M	SD	Min–Max	Levels
important health	415	77.43	24.56	1–4	not important – very important
important eco	416	69.15	29.48	1–4	not important – very important
important habit	416	66.11	27.03	1–4	not important – very important
important purity	413	83.05	22.35	1–4	not important – very important
			Normative beliefs		
oblig serve BW	730	41.82	31.68	1–5	not – very strong
misplace get TW	731	24.28	25.58	1–7	very adequate – very misplaced
oblig order BW	730	51.54	32.02	1–5	not – very strong
important N drink TW	720	58.51	24.34	1–5	nobody – almost all
important N drink BW	684	61.15	22.00	1–5	nobody – almost all
important N drink TW	672	44.38	26.73	1–5	nobody – almost all
important N drink BW	668	65.34	23.76	1–5	nobody – almost all
important others think	716	9.59	19.50	1–4	not important – very important
important others do	718	13.51	22.51	1–4	not important – very important

Table C.1.: Variables in the data set in Switzerland... (continued).

Factor label	N	M	SD	Min–Max	Levels
important others think	415	9.16	19.29	1–4	not important – very important
important others do	414	12.24	21.65	1–4	not important – very important
			Control beliefs		
price TW	722	62.37	25.70	1–7	very expensive – very cheap
price BW	709	42.24	25.49	1–7	very expensive – very cheap
important price	721	55.76	31.30	1–4	not important – very important
important convenient	722	61.31	32.69	1–4	not important – very important
important avail	719	77.75	25.24	1–4	not important – very important
important price	415	44.10	34.39	1–4	not important – very important
important convenient	416	70.19	29.51	1–4	not important – very important
important avail	415	78.15	24.94	1–4	not important – very important
price PoUS	337	31.36	19.61	1–7	very expensive – very cheap
			Situational determinants		
satisf TW	729	82.01	28.40	1–7	very unsatisfied – very satisfied

Table C.1.: Variables in the data set in Switzerland... (continued).

Factor label	N	M	SD	Min–Max	Levels
satisf BW	680	75.32	25.81	1–7	very unsatisfied – very satisfied
trust TW	730	80.10	19.12	1–5	not – very much
trust BW	712	77.60	21.10	1–5	not – very much
neg exp TW	730	14.08	17.56	1–5	never – very often
neg exp BW	714	11.06	16.65	1–5	never – very often
knowl TW	727	47.94	19.88	1–5	nothing – very much
knowl BW	716	45.15	19.92	1–5	nothing – very much
important carbonate	710	28.92	33.06	1–4	not important – very important
important trust	723	86.54	19.54	1–4	not important – very important
important carbonate	412	29.37	34.69	1–4	not important – very important
important trust	416	82.53	22.66	1–4	not important – very important
knowl PoUS	715	38.92	21.95	1–5	nothing – very much
satisf PoUS	305	71.58	23.40	1–7	very unsatisfied – very satisfied
healthy PoUS	338	64.50	21.30	1–7	very unhealthy – very healthy

Table C.1.: Variables in the data set in Switzerland... (continued).

Factor label	N	M	SD	Min–Max	Levels
neg exp PoUS	335	12.54	18.94	1–5	never – very often
			Emotional components		
identity viol	725	73.72	26.62	1–5	not – very strong
compel	724	79.11	22.76	1–5	not – very strong
anxiety	724	60.64	26.12	1–5	not – very much
contradiction	718	52.27	33.43	1–7	very unpleasant – very pleasant
jealousy	716	71.51	31.82	1–5	not – very strong
sympathy	719	74.03	24.45	1–5	no – very much
fair	717	17.85	20.86	1–7	very unfair – very fair
anger	717	73.85	26.65	1–5	no – very much
			Demographics		
age	727	57.80	17.50	14–90	
sex	731	1.51	0.50	1–2	female – male
n pers	726	30.96	15.52	1–8	

Table C.1.: Variables in the data set in Switzerland... (continued).

Factor label	N	M	SD	Min–Max	Levels
class	729	49.38	17.42	1–5	lower class – upper class
edu	726	47.05	23.13	1–6	primary school – doctorate
			Structural determinants		
src spring	410	42.79	41.91	0–100	
src ground	410	37.78	41.90	0–100	
src lake	410	17.58	32.76	0–100	
res area	727	37.07	40.20	1–3	rural – city
			Information factors (not analysed here)		
f use rad/tv	721	60.96	29.95	1–5	never – very often
f use net	697	46.88	35.28	1–5	never – very often
f use print	725	67.00	26.21	1–5	never – very often
n info rad/tv	717	30.72	20.90	1–5	no – very much
n info net	697	23.53	26.20	1–5	no – very much
n info print	723	43.64	23.81	1–5	no – very much

Table C.1.: Variables in the data set in Switzerland... (continued).

Factor label	N	M	SD	Min–Max	Levels
n info talk	724	42.58	24.55	1–5	no – very much
trust rad/tv	701	61.82	18.48	1–4	not – very much
trust net	614	54.02	22.87	1–4	not – very much
trust print	708	63.51	17.58	1–4	not – very much
trust talk	699	60.13	20.35	1–4	not – very much

Table C.2.: Variables in the questionnaire in Nairobi. Shown per factor group is the variable's short label, number of responses, statistics of responses, and (if given) the labels of the levels.

Factor label	N	M	SD	Min–Max	Levels
			Dependent variables		
ceramic filter	537	5.77	19.18	1–3	don't know – use
straw filter	537	2.61	12.69	1–3	don't know – use
chemical disinfection	537	44.04	31.91	1–3	don't know – use
sand filter	537	2.42	12.73	1–3	don't know – use
SODIS	537	6.33	22.38	1–3	don't know – use
boiling	537	64.34	36.38	1–3	don't know – use
buying bottles	537	30.54	42.63	1–3	don't know – use
n PoUS known	537	42.21	22.99	0–3	
n PoUS used	537	30.91	19.11	0–3	
PoUS know use any	537	90.13	20.61	1–3	don't know, know, use
is a user or a knower	534	0.81	0.39	0–1	
consumption treated	537	14.30	14.03	0–5	
consumption untreated	537	4.82	11.34	0–4	

Table C.2.: Variables in the questionnaire in Nairobi... (continued).

Factor label	N	M	SD	Min–Max	Levels
consumption ratio treat	537	79.32	39.65	0–1	
consumption (factor)	537	79.14	39.62	1–3	untreated – treated
			Vulnerability		
dri. makes healthier	534	72.97	28.69	1–7	a lot healthier – a lot more unhealthy
			Instrumental belief		
import. healthy w	532	91.79	17.16	1–4	not important at all – very important
easy ceramic	43	67.44	35.81	1–7	very difficult – very easy
easy straw	22	50.00	29.55	1–7	very difficult – very easy
easy chemical	330	68.64	33.89	1–7	very difficult – very easy
easy sand	19	57.02	34.83	1–7	very difficult – very easy
easy SODIS	37	83.78	26.49	1–7	very difficult – very easy
easy boiling	417	62.15	36.46	1–7	very difficult – very easy
easy bottles	189	79.19	29.16	1–7	very difficult – very easy
cheap ceramic	40	60.42	35.34	1–7	very expensive – very cheap

Table C.2.: Variables in the questionnaire in Nairobi... (continued).

Factor label	N	M	SD	Min–Max	Levels
cheap straw	17	42.16	29.53	1–7	very expensive – very cheap
cheap chemical	308	72.13	28.18	1–7	very expensive – very cheap
cheap sand	20	40.00	36.83	1–7	very expensive – very cheap
cheap SODIS	36	85.65	20.37	2–7	very expensive – very cheap
cheap boiling	411	48.30	33.75	1–7	very expensive – very cheap
cheap bottles	192	46.79	35.07	1–7	very expensive – very cheap
rely ceramic	41	75.20	27.16	1–7	very unreliable – very reliable
rely straw	18	62.96	29.46	1–7	very unreliable – very reliable
rely chemical	289	73.88	27.97	1–7	very unreliable – very reliable
rely sand	15	71.11	31.16	1–7	very unreliable – very reliable
rely SODIS	35	84.29	25.55	2–7	very unreliable – very reliable
rely boiling	389	79.56	23.93	1–7	very unreliable – very reliable
rely bottles	188	79.79	27.40	1–7	very unreliable – very reliable
enhance odour ceramic	36	56.94	21.59	1–7	very much diminishes – very much enhances

Table C.2.: Variables in the questionnaire in Nairobi... (continued).

Factor label	N	M	SD	Min–Max	Levels
enhance odour straw	12	58.33	28.87	1–7	very much diminishes – very much enhances
enhance odour chemical	256	53.06	26.29	1–7	very much diminishes – very much enhances
enhance odour sand	15	60.00	22.54	2–7	very much diminishes – very much enhances
enhance odour SODIS	30	50.00	29.03	1–7	very much diminishes – very much enhances
enhance odour boiling	367	50.41	22.53	1–7	very much diminishes – very much enhances
enhance odour bottles	177	55.08	19.60	1–7	very much diminishes – very much enhances
enhance flavour ceramic	35	60.48	17.19	3–7	very much diminishes – very much enhances
enhance flavour straw	12	66.67	21.32	4–7	very much diminishes – very much enhances
enhance flavour chemical	263	45.75	25.88	1–7	very much diminishes – very much enhances
enhance flavour sand	14	54.76	10.19	4–6	very much diminishes – very much enhances
enhance flavour SODIS	29	59.77	28.00	1–7	very much diminishes – very much enhances
enhance flavour boiling	371	44.88	21.49	1–7	very much diminishes – very much enhances
enhance flavour bottles	174	54.98	18.98	1–7	very much diminishes – very much enhances
enhance appearance ceramic	35	63.33	21.69	2–7	very much diminishes – very much enhances

Table C.2.: Variables in the questionnaire in Nairobi... (continued).

Factor label	N	M	SD	Min–Max	Levels
enhance appearance straw	14	61.90	24.83	2–7	very much diminishes – very much enhances
enhance appearance chemical	264	51.64	16.10	1–7	very much diminishes – very much enhances
enhance appearance sand	14	57.14	14.19	4–6	very much diminishes – very much enhances
enhance appearance SODIS	29	53.45	19.61	1–7	very much diminishes – very much enhances
enhance appearance boiling	368	49.55	15.80	1–7	very much diminishes – very much enhances
enhance appearance bottles	176	55.30	18.18	1–7	very much diminishes – very much enhances
time required for ceramic	33	22.22	36.96	1–4	not time-consuming at all – very time-consuming
time required for straw	9	59.26	40.06	1–4	not time-consuming at all – very time-consuming
time required for chemical	282	11.58	24.35	1–4	not time-consuming at all – very time-consuming
time required for sand	12	22.22	29.59	1–4	not time-consuming at all – very time-consuming
time required for SODIS	34	25.49	37.66	1–4	not time-consuming at all – very time-consuming
time required for boiling	389	37.79	32.24	1–4	not time-consuming at all – very time-consuming
time required for bottles	183	22.40	30.50	1–4	not time-consuming at all – very time-consuming
enhance health ceramic	43	82.17	18.33	1–7	a lot more unhealthy – a lot healthier

Table C.2.: Variables in the questionnaire in Nairobi... (continued).

Factor label	N	M	SD	Min–Max	Levels
enhance health straw	19	74.56	21.06	3–7	a lot more unhealthy – a lot healthier
enhance health chemical	301	70.54	27.88	1–7	a lot more unhealthy – a lot healthier
enhance health sand	15	75.56	17.67	4–7	a lot more unhealthy – a lot healthier
enhance health SODIS	33	78.79	24.03	2–7	a lot more unhealthy – a lot healthier
enhance health boiling	383	81.59	17.01	1–7	a lot more unhealthy – a lot healthier
enhance health bottles	185	83.06	19.85	1–7	a lot more unhealthy – a lot healthier
costs worth treat	530	90.31	19.86	1–7	it costs a lot more than it is worth – it is worth a lot more than it costs
				Affective belief	
good to treat	535	89.88	17.03	1–7	very bad – very good
good talk	536	90.64	13.63	2–7	very bad – very good
				Descriptive norm	
N others use ceramic	32	12.69	24.64	0–50	
N others use straw	18	9.89	23.09	0–50	

Table C.2.: Variables in the questionnaire in Nairobi... (continued).

Factor label	N	M	SD	Min–Max	Levels
N others use chemical	303	13.10	24.31	0–50	
N others use sand	16	13.00	26.03	0–50	
N others use SODIS	37	49.41	38.59	0–50	
N others use boiling	389	15.42	24.69	0–50	
N others use bottles	162	20.81	30.94	0–50	
			Injunctive norm		
N others think ceramic	38	73.25	20.70	2–7	very negatively – very positively
N others think straw	14	70.24	19.81	4–7	very negatively – very positively
N others think chemical	256	64.65	26.68	1–7	very negatively – very positively
N others think sand	11	74.24	18.80	4–7	very negatively – very positively
N others think SODIS	32	72.40	30.41	2–7	very negatively – very positively
N others think boiling	354	73.12	22.96	2–7	very negatively – very positively
N others think bottles	175	74.57	25.07	1–7	very negatively – very positively
N social image	535	63.24	18.18	2–7	very much decreases – very much increases

Table C.2.: Variables in the questionnaire in Nairobi... (continued).

Factor label	N	M	SD	Min–Max	Levels
			Personal norm		
responsib. health	535	90.97	18.23	1–4	not responsible at all – very responsible
			Frequency of communication		
n and times suffer	537	2.06	7.31	0–28	
			Response-efficacy		
effect ceramic	40	82.08	24.28	2–7	very ineffectively – very effectively
effect straw	17	71.57	22.64	4–7	very ineffectively – very effectively
effect chemical	272	78.62	24.70	1–7	very ineffectively – very effectively
effect sand	17	71.57	30.48	1–7	very ineffectively – very effectively
effect SODIS	34	82.84	28.86	1–7	very ineffectively – very effectively
effect boiling	384	85.85	19.03	1–7	very ineffectively – very effectively
effect bottles	180	85.46	23.96	1–7	very ineffectively – very effectively
			Controllability		

Table C.2.: Variables in the questionnaire in Nairobi... (continued).

Factor label	N	M	SD	Min–Max	Levels
h available	532	78.73	32.03	2–168	
avail. ceramic	41	75.61	29.84	1–7	very scarce – very plentiful
avail. straw	17	61.76	36.69	1–7	very scarce – very plentiful
avail. chemical	302	84.44	18.24	1–7	very scarce – very plentiful
avail. sand	17	68.63	33.27	1–7	very scarce – very plentiful
avail. SODIS	37	88.74	14.19	3–7	very scarce – very plentiful
avail. boiling	391	82.86	21.56	1–7	very scarce – very plentiful
avail. bottles	189	87.57	19.44	1–7	very scarce – very plentiful
be responsible	534	82.65	26.67	1–4	not responsible at all – very responsible
				Emotion	
anxiety	525	68.57	36.27	1–4	no anxiety at all – very much anxiety
compulsion	533	60.73	41.18	1–4	not compelled at all – very compelled
self-esteem	535	63.93	19.29	1–7	very much decreases – very much increases
superiority	533	63.91	19.86	1–7	very inferior – very superior

Table C.2.: Variables in the questionnaire in Nairobi... (continued).

Factor label	N	M	SD	Min–Max	Levels
worry	534	36.64	41.74	1–4	no worry at all – very much worry
sympathy	534	72.72	35.11	1–4	no sympathy at all – very much sympathy
				Demography	
estate	537	48.16	33.59	1–6	Kibera – Runda
sex	537	62.38	48.49	1–2	male – female
edu	524	69.37	28.11	1–5	none – university degree
occupation	536	5.14	1.87	1–9	unemployed – retired
n persons	537	31.55	14.25	1–14	
m age	534	33.51	11.76	3.5–78	
n rooms	534	25.68	18.42	1–20	
income	531	63.72	38.28	1–7	<5,000 – >100,000
				Structure	
source	537	2.28	1.53	1–6	municipal private – Runda Waters

Curriculum Vitae

Contact

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Personal data

Place/date of birth	Lichtenstein (Saxony), 25 March 1972
Civil status	Single
Nationality	German

Professional experiences

2006–2011	Lectured beginner's courses in $\mathcal{R}$. Attended courses in statistics using $\mathcal{R}$, structural equation modelling (Amos), and generalised linear models (GLM). Initiated a discussion group on issues of measurement in psychology. Administered the group-server and web site for own research group. Wrote short How-Tos on methodological and statistical issues and was a reference person for technical and statistical assistance.
2007	Worked in Nairobi, Kenya, for 6 weeks, to conduct research (survey, interviews) on the use of water treatment devices with local co-researchers.

2005–2006 Wrote articles for the newspaper "Freie Presse" as freelancer. Freelance lecturer in Psychology at a private educational institute for adults.

1999–2005 Taught freshmen and undergraduates in methods and statistics for psychology, and worked as a student assistant.

1998–2005 Studied psychology at the Chemnitz University of Technology (Saxony, Germany).

2003 Was a computer network administrator and help-desk assistant at "AVENTIS Pharma GmbH Frankfurt am Main" (Hesse, Germany). Assisted assessments and management diagnostics at "md gesellschaft für management-diagnostik mbh" in Hamburg (Hamburg, Germany).

1992–1998 Worked as a customer consultant and office manager at the "Kreissparkasse Hohenstein-Ernstthal" and "Sparkasse Chemnitz" (both banks in Saxony, Germany).

1994–1995 Did civil service as a caretaker at the retirement home Heinrichsort (Saxony, Germany).

1990–1992 Did an apprenticeship as a banker at the Sparkasse Schwandorf (Bavaria, Germany).

Current education titles

2006–2011 PhD student at the University of Zurich (Social Psychology); funding and research institute: Eawag, Swiss Federal Institute of Aquatic Science and Technology, Department of Integrated Systems Analysis and Modelling; PhD thesis: "Psychological backgrounds of drinking tap water or drinking bottled water or using treatment devices"

2006 Non-medical practitioner in psychotherapy

2005 Diploma in psychology, Chemnitz University of Technology, Institute of Psychology; diploma's thesis: "Topicality

and update of knowledge among students in psychology (Wissensaktualität und Wissensaktualisierung bei Studierenden der Psychologie)"

1992 Qualified bank clerk (Bankkaufmann)

Personal skills

Languages: German (native speaker), English (advanced/fluent)

Computer skills: Statistics software: $\mathcal{R}$, SPSS, Amos, M-Plus; office software: OpenOffice.org, Apple iWorks, Microsoft Office; typesetting: LaTeX, BibTeX, BibLaTeX; graphics: Gimp, ImageMagick, Adobe Photoshop; programming: $\mathcal{R}$, PHP, HTML, Bash, MySQL; operating systems: Mac OS X, Linux, Microsoft Windows; network and server administration: Samba, remote control, apache web server, SSH, CVS

Publications and presentations

Albert, C., & Vogel, S. (in preparation). GUTS: an $\mathcal{R}$package implementing a stochastic survival model.

Vogel, S., Zurbrügg, C., & Mosler, H.-J. (in preparation). Factors influencing the use or non-use of Point-of-Use systems in Nairobi, Kenya.

Vogel, S., & Mosler, H.-J. (submitted). Psychological factors of tap-water versus bottled-water consumption among the German-speaking Swiss.

Vogel, S. (2009). Drinking water consumption patterns among the German speaking Swiss. Presentation at the 11$^{\text{th}}$ European Congress of Psychology (ECP) 2009, 7.7.–10.7.2010, Oslo, Norway.

Oswald, D., Vogel, S., Zurbrügg, C., Pronk, W., & Mosler, H.-J. (2008). Motives to use Point-of-Use-Systems (PoUS)

in a city with uncertain drinking water quality. Presentation at the Eawag Action Field Symposium, 16.9.2008, Eawag, Dübendorf, Switzerland.

Vogel, S. (2008). Factors influencing sustainable consumption of drinking water in Switzerland. Presentation at the 20th IAPS Conference Rome, 28.7.–1.8.2008, Rome, Italy.

Vogel, S. (2007). Players, positions, and opinions at the Swiss-German drinking-water market. Presentation at the Environmental Psychology Conference 2007, 9.9.2007–12.9.2007, University of Bayreuth, Germany.